Railway Age Gazette

PUBLISHED EVERY FRIDAY AND DAILY EIGHT TIMES IN JUNE BY THE
SIMMONS-BOARDMAN PUBLISHING COMPANY
WOOLWORTH BUILDING, NEW YORK.

CHICAGO: Transportation Bldg. CLEVELAND: Citizens' Bldg.
LONDON: Queen Anne's Chambers, Westminster.

E. A. SIMMONS, *President.*
L. B. SHERMAN, *Vice-President.* HENRY LEE, *Sec'y & Treas.*
The address of the company is the address of the officers.

EDITORS:

SAMUEL O. DUNN, *Editor.*
ROY V. WRIGHT, *Managing Editor.*

W. E. HOOPER	H. F. LANE	W. S. LACHER
B. B. ADAMS	R. E. THAYER	C. W. FOSS
E. T. HOWSON	A. C. LOUDON	F. W. KRAEGER
H. H. SIMMONS	C. B. PECK	G. L. LACHER

Subscriptions, including 52 regular weekly issues and special daily editions published from time to time in New York, or in places other than New York, payable in advance and postage free:

United States and Mexico..... $5.00
Canada 6.00
Foreign Countries (excepting daily editions)..... 8.00
Single copies.....15 cents each

Engineering and Maintenance of Way Edition and four Maintenance of Way Convention daily issues, North America, $1; foreign, $2.

Entered at the Post Office at New York, N. Y., as mail matter of the second class.

WE GUARANTEE, that of this issue (the monthly Engineering and Maintenance Edition) 10,750 copies were printed; that of these 10,750 copies 7,270 were mailed to regular paid subscribers to the weekly edition, 1,846 to subscribers who get the Engineering and Maintenance Edition only, 135 were provided for counter and news companies' sales, 1,034 were mailed to advertisers, exchanges and correspondents, and 465 were provided for new subscriptions, samples, copies lost in the mail and office use; that the total copies printed this year to date were 433,450, an average of 9,222 copies a week.

The RAILWAY AGE GAZETTE and all other Simmons-Boardman publications are members of the Audit Bureau of Circulations.

VOLUME 59 NOVEMBER 19, 1915 No. 21

Contents

EDITORIAL:
Editorial Notes 927
Ten Dollars for a Dialogue..... 927
"The Outlook" on Railroad Receiverships..... 928
The Scarcity of Freight Cars..... 928
The Missouri Commission Allows Rate Advances..... 929
The Commission and Western Freight Rates..... 930
*Baltimore & Ohio..... 930
*Pere Marquette 931
NEW BOOKS 932
MISCELLANEOUS:
Mikado Versus Consolidation Locomotives..... 933
Bureau Report on Ardmore Explosion..... 935
*Electric Interlocking at Adelaide, South Australia; C. G. Pilkington. 936
Railway Development Association 938
The Fuel Department—A Constructive Criticism; L. G. Plant..... 939
Missouri Commission Allows General Advances in Rates..... 942
*The Efficiency of French Women as Railway Workers; Walter S. Hiatt 943
Report of Special Committee..... 945
Possible Railway Securities Legislation; W. L. Stoddard..... 946
American Railway Association..... 947

MAINTENANCE OF WAY SECTION

EDITORIAL:
Editorial Notes 949
Changing the Fiscal Years..... 949
Proper Records of Reinforced Concrete Structures..... 949
The Maintenance of Way Associations..... 950
NEW BOOKS 950
LETTERS TO THE EDITOR:
A Graduated Wage Scale; R. E. Pitts..... 951
Turning Ties Over; W. E. Schott..... 951
Elevating Curves in Yards; Henry Koch..... 951
MISCELLANEOUS:
*The Proper Repair of Tools for Track Maintenance; M. E. Carroll.. 952
Abstract of Engineering Articles..... 954
The Stability of Unanchored Tanks; C. R. Knowles..... 954
*Railway Roadside Water Tanks for Locomotive Supply..... 955
*Adjusting Railroad Track Scales..... 958
*Difficult Grade Crossing Elimination in Albany, N. Y..... 961
The Rapid Improvement of a Section; Kenneth L. Van Auken..... 963
Concrete Floor Troubles; MacRae D. Campbell..... 965
*Lining a Double Track Railway Tunnel Under Traffic; Rodman Meacham 966
*Maintenance of Way Master Painters' Convention..... 968
Tie Purchases in Canada..... 970
*Construction Work on the Amur (Siberian) Railway; W. A. D. Short. 971
Chicago, Milwaukee & St. Paul Roadmasters' Association..... 972
Early Tonnage Studies 972
GENERAL NEWS SECTION..... 973

*Illustrated.

Economical Distribution and Purchase of Power

The importance of making a careful economic study of the distribution of power between the various divisions of a road and the benefits that will accrue from such a study when the purchase of new or additional power is considered is forcefully illustrated in the article on Mikado Versus Consolidation Locomotive by N. D. Ballantine, printed elsewhere in this issue. Mr. Ballantine outlines the method followed by the Rock Island for the determination of the most economic distribution of power between four divisions of that road, and while the conditions obtaining on the Rock Island controlled, to a certain extent, the method of procedure, the outline will serve as a guide to others desiring to make a similar study. In the problems discussed, Consolidation locomotives using saturated steam were compared with Mikado locomotives using superheated steam and having a tractive effort 46 per cent greater than the Consolidations. With both types of locomotives loaded to their full rating a saving would naturally be expected by the use of the Mikados, but the low loading efficiencies (51.3 per cent on Division *A*) obtained in the study make it interesting to note that the Mikados proved to be the most economical engines. Division *B*, having the highest loading efficiency, showed the greatest saving, namely, 23.3 per cent. These results should make it plain that in order to know exactly what is actually being accomplished some such study should be made. With the data obtained from such investigations the opportunities for study with resultant increases in efficiency are almost unlimited and if similar studies are made before the purchase of new or additional power there is no question but that the power bought would more efficiently meet the traffic requirements with ultimate saving in the investment and operation.

The "Profitableness" of Railway Mail Pay

The postoffice department evidently intends to continue its fight to prevent the compensation of the railways for carrying the mails from being put on a remunerative basis; and it is not scrupulous in its choice of weapons. The lack of fairness it has shown and is still showing regarding this matter should warn people who are disposed to favor extensions of government ownership and operation of business concerns. As the department is so arbitrary and unfair may we not assume that a government management of the telegraphs or the railroads might also be arbitrary and unfair? These thoughts are suggested by a statement prepared by the department and published in the newspapers on November 14. This shows that the railways of certain territories are to receive an increase in their mail compensation, and might convey the impression that the increase is due to advances in the mail rates. In fact, it will be due to increases in the amount of mail traffic handled. The department points out that there is active competition between the railways for an opportunity to carry mails on certain routes, and concludes that this is "good evidence of the unjustness of the oft-repeated assertion that the railroads are handling the mails at a loss." This logic is as imbecile as the want of efficiency shown in managing most of the affairs of the department. The two routes to which the department's statement specifically refers are those between New York and Chicago and between Chicago and Minneapolis. The mail traffic on these routes is extremely dense. Now, no one claims that the railways do not make a profit from the mail traffic on the densest routes in the country. What is claimed is that their compensation for carrying the mail on all routes, those on which the traffic is light as well as those on which it it heavy, is inadequate. Furthermore, active competition for the mail business on every route would prove nothing as to the remunerativeness of the rates. If a man had a sum of money to lend, and the law prohibited him from receiving more than two per cent interest, he probably would accept it, although he might denounce as unjust a statute which prohibited him from receiving less than six, or even eight per cent. He would be better off with two per cent than with nothing at all. The

case of the railways is analogous. A road would rather carry the mail if it earned only two, or even one per cent, on the investment in facilities devoted to that service than not to carry it at all. As, however, railways need to earn six or seven per cent on their business, as a whole, and as the mail traffic is of such a character that it can easily afford to pay rates which will yield a fair profit, the roads, very naturally, complain of legislation and department orders which have been shown to restrict them to a return on their mail traffic smaller than the return they derive from handling either freight, passengers or express. The government is constantly preaching to private corporations the doctrine of equity in transacting their business, but there is not a business concern in the United States which is as petty and unfair in its business methods, or is as pertinacious in seeking unfair discriminations from the railways, as is the postoffice department; nor is there one which defends its course with such fallacious and dishonest arguments.

TEN DOLLARS FOR A DIALOGUE

ONE of the significant remarks at the recent "safety first" meetings in Philadelphia, reported in the *Railway Age Gazette* October 29, was that of F. T. Bowler, one of the Pennsylvania's committeemen, who said that in admonishing fellow-employees he made enemies for himself. In giving advice that is not asked for, on subjects which the person addressed thinks he knows fully already, one always runs that risk. And yet the safety-first propaganda owes much of its progress to just this thing; stirring up men's minds on matters in which they had thought they needed no further light. How is it done? Or, rather, what is the best way in which to do this disagreeable thing with the least friction? Pages and pages, and whole books, have been written, but the rules to be followed are still vague and shadowy.

In this paucity of acceptable theory we may do well to study actual practice. Who has succeeded in giving undesired advice with pleasant results? What did the other fellow say? Give the readers of the *Railway Age Gazette* the whole conversation. For the three best dialogues of this character, concerning "safety-first," we will pay ten dollars each. The thing desired is actual experience; report conversations verbatim. Dialogues should not contain more than three or four hundred words each, but very good ones will be accepted even if longer. After the best three the regular rate will be paid for others which are used. All must reach New York by December 31.

Each writer should give all necessary explanations, and, in particular, his own position and that of the person spoken to, whether superior, inferior or equal. Writers must give their names, but matter may be published without names where mutually agreeable.

"THE OUTLOOK" ON RAILROAD RECEIVERSHIPS

WHEN a paper with such breadth of vision and reputation for scholarly accuracy as The Outlook makes an absurd blunder in discussing railroad receiverships and regulation it is pretty good evidence of how much there still is to be done in the way of frank discussion of railroad problems before these problems will be understood by the great majority of educated people. The Outlook agrees with the *Railway Age Gazette* that state regulation as opposed to and conflicting with federal regulation is pernicious. But The Outlook is a bit suspicious that in a recent article discussing railway receiverships the *Railway Age Gazette* was attempting "to discredit the general principles of government regulation." It would, indeed, take a hardened fighter of the old school of railroad men to come out now in favor of the abolition of government regulation of railroads.

The Outlook adds: "If government regulation can be applied successfully to railways through receiverships it is certainly possible to apply it successfully through a federal commission." Would The Outlook say that because a federal court can appoint a manager for a bankrupt dry goods firm, this is proof that the United States government can regulate the dry goods business of the country? There is no more connection between regulation and receivership in the one case than in the other. A receiver is a man appointed by a court, as an officer of the court, to so administer a business as to preserve the assets for the benefit of the creditors, the stockholders and all others who may be concerned; and he performs the functions of management, not of regulation. Regulation may and often does assume some of the functions of administration. It is a matter for the courts to determine just how far in each case regulation can go without depriving the owner of rights which under the constitution can be taken from him only by due process of law.

The Outlook says that railway receiverships have been generally successful financially. What this can mean it is difficult to see. A receivership is successful if it preserves intact the assets of the creditors of the bankrupt corporation. In the case of a railroad company, the most important asset which it has is its earning power. This can be conserved through a wise policy of maintenance, a sound and aggressive bid for traffic and the economical conduct of the business of transportation. The court which assumes charge of a property when it is taken out of the hands of its owners appoints one or more receivers. Often one of these receivers is a lawyer, the other an operating man—a railroad man. If, however, a lawyer only is appointed as receiver, his first step is invariably to appoint an operating man as his representative to run the railroad, and this man manages the railroad, whether his title be receiver or chief operating officer for the receiver. In the one case he reports directly to the court in the same way as the president of a solvent railroad company reports to the directors; in the other case he reports to the receiver, who in turn reports to the court. In any event, the seeming success of the receiver always is due to the fact that he can and does use in operating and improving the property parts of the earnings which a manager for a private corporation would have to pay out in interest. If this is "financial success" it is a queer kind!

Would The Outlook suggest that the Interstate Commerce Commission appoint a chief operating officer for each one of the railroad companies of the United States, which officer should report to it instead of the board of directors? Only so could there be any analogy between the administration of a railroad property under receivership and the regulation of railroads by the Interstate Commerce Commission; and this would not be government regulation, but government management.

THE SCARCITY OF FREIGHT CARS

A SHORT time ago the remark was made in these columns that "this year, talk of a car shortage would seem as music to the ears not only of railroad officers, but of most business men also." Since that time, somewhat unexpectedly, the band has begun to play. But while most people are inclined to welcome the sound as the herald of returning prosperity there are some discords. If business conditions during the past two years had not been such that the roads were more worried about the large actual number of surplus cars than about possible shortages of equipment they might have had more money to buy more new cars before they were needed. As it has happened, the revival of business has succeeded the long period of depression so suddenly that the large surpluses have melted away almost over night, and shortages are appearing in many parts of the country—shortages of box cars in Central Freight Association territory and the Northwest, and of coal cars in Trunk Line and Central Freight Association territory.

The monthly bulletin of the Committee on Relations between Railroads of the American Railway Association for November 1 showed a shortage of 26,628 cars and a surplus of 52,867, the smallest net surplus since the fall of 1913, the surplus having been reduced by 35,474 in October and by 103,248 in September. For 90 per cent of the time since 1907 the American Railway

Association has reported large surpluses, but now the shippers are filling the newspapers with complaints because they cannot get cars and the Interstate Commerce Commission and some of the state commissions are issuing the usual circulars urging the railroads and shippers to co-operate by handling and releasing cars as promptly as possible. The Interstate Commerce Commission also urges the railroads to endeavor to improve their methods of operation of terminals.

All of this sounds very much like old times, but some of the conditions which are at the bottom of the present situation emphasize the need of a remedy different from those that usually are suggested. The failure of car supply is ordinarily a failure of car movement. In the present case it is largely caused by a shortage of vessel capacity as a result of the European war. There has been for some time a serious congestion of freight at New York and to a less extent at other Atlantic and Gulf ports. The movement of export grain and of many other articles for export, including war materials, is very heavy, and the trunk lines have many miles of side tracks at the ports filled with delayed cars. It is reported that over 50,000 cars, nearly twice the amount of the shortages reported for the entire country, are thus tied up in the vicinity of New York alone, and it was recently estimated that there was ready for export at New York harbor five times as much freight as the available vessels could take.

The situation has been aggravated by the closing of the Panama Canal by slides since September 20. While the Panama Railroad has trans-shipped a large amount of the freight that had started through the canal before the slides occurred, the closing of the canal has resulted in much congestion of freight at the Gulf ports and the number of boats that have taken their cargoes around South America or the Cape of Good Hope has appreciably diminished the vessel capacity available at the United States ports.

Meanwhile, as there is no demurrage or storage charge on export grain and very little charge on other export freight, the accumulation at the ports continues to be increased by shipments from the interior, and thousands of cars are being used as warehouses, while shippers that want cars are clamoring for them elsewhere. If adequate demurrage and storage could be charged shippers would not keep sending shipments to the congested ports, but would hold back some of their freight until there appeared some chance of its being loaded into vessels.

A similar situation arose at Galveston in August, 1914, immediately after the war started, when an enormous congestion of freight was caused by the shortage of vessels, and so much demurrage accrued that Commissioner Clark of the Interstate Commerce Commission recommended to the roads that demurrage be cancelled, without admitting, however, "that the principle of demurrage on export grain is wrong or a mistaken one." Commissioner Clark at that time was dealing with an unprecedented situation. No one had warning of the war and the shippers had a right to expect that vessels would be available for their shipments. But now the war has been in progress for over 15 months. The scarcity of ships is well understood, and a penalty for sending export shipments to points of congestion without having made some arrangements for their disposition would not be unjust and would help to relieve the congestion.

The railroads themselves have been unable to agree on a demurrage or storage charge, for the usual reason that some roads have preferred to please the shippers who do not like to pay demurrage. The Committee on Relations between Railways in its report to the American Railway Association, at its meeting on Wednesday, said: "One cause of delay to box cars has been that it has not usually been practicable to charge demurrage on cars loaded with export grain consigned to elevators located at the seaboard. Your committee has represented to the traffic associations that the greatest congestions have occurred when the export elevators are filled with grain, and it is, therefore, impossible to unload the cars consigned to them. The point has further been made that this situation would be improved if the storage rates applicable to grain in the elevators should also apply to the grain in cars which cannot be unloaded into the elevators." The report added that the railway traffic associations have taken up the suggestion and that it had been hoped that the arrangement could go into effect as of December 1, at all Atlantic and Gulf ports; but Arthur Hale, chairman of the committee, stated at the meeting that the hopes had not been well founded.

The Interstate Commerce Commission has tried to bring about co-operation between the railroads and the shippers to minimize car shortages by prompt handling of cars. If it would promote the efforts to establish a demurrage or storage charge on export shipments something tangible might be accomplished toward the alleviation of such situations as the present one, and their prevention in future. The commission, by immediately calling representatives of the carriers and of the leading boards of trade together at Washington and keeping them there until they agreed upon something, without the long, painful process of hearings and the usual procedure, could apply the remedy in time to do some good this year.

MISSOURI COMMISSION ALLOWS RATE ADVANCES

THE Missouri Public Service Commission has just rendered a decision, reported elsewhere in this issue, which is unique in the annals of state railway regulation. It allows not only a general advance in passenger fares but an increase in freight rates, which, with some exceptions, is estimated to average about 5 per cent. Orders of state commissions ordering extensive reductions in both freight and passenger rates are not unknown. and several commissions have recently authorized increases either in freight rates or in passenger fares, but this is believed to be the first case on record of a voluntary, comprehensive decision by a state commission affecting both branches of the service favorable to the requests of the carriers.

The railroads are not given all they asked for. They had requested a passenger rate of 3 cents a mile in place of the present rate of 2 cents, and the commission has granted them permission to charge 2½ cents a mile for one-way tickets, 2¼ cents for round-trip tickets and 2 cents for mileage books. They had asked for general increases in freight rates and the commission has excepted some commodities and reduced the proposed advance on others. But considering the circumstances, the long and unsuccessful fight the railroads have waged in the courts and the fact that the commission is overruling the acts of the state legislature, the commission is to be congratulated on an act of broad statesmanship.

The decision includes some 300 typewritten pages, and printed copies have not yet been distributed, but extracts from the opinion, which is unanimous, make it clear that the commissioners were convinced that regulation of railway rates downward has gone altogether too far, that to obtain good railroad service it is necessary to encourage further investment, and that it is unjust to penalize all of the carriers for individual instances of corporate mismanagement. It is also noted that the commission finds from the evidence that the reduction of passenger fares from 3 cents to 2 cents a mile was not compensated by an increase in traffic. The passenger rates, which the railroads are allowed to advance, were reduced by the legislature in 1907 and the freight rates in 1905, and in 1907 by the legislature. Temporary injunctions were secured by the roads in the federal court, but in 1913 the United States Supreme Court decided that the railroads had not succeeded in proving the rates confiscatory. As the condition of the railroads became steadily worse, the way for an appeal to the commission was paved by a decision of the state supreme court in the case of the Missouri Southern, holding that the act creating the public service commission and authorizing it to pass upon the reasonableness of rates had given the commission jurisdiction to set aside the statutory rates.

As would naturally be expected in Missouri, the commission was not easily convinced and its decision was not reached until after a most thorough investigation and a protracted series of hearings in which the railroads presented a voluminous record

of statistical and other evidence. Moreover, its action was not taken until most of the railway mileage of the state had passed into the hands of receivers. Missouri having been "shown," it would seem that a large number of other states, which are still trying to reduce rates or are opposing increases or in which applications for advances are still pending, might find it profitable to give serious consideration to so excellent an example before their railways reach the extreme condition which has prompted such a reversal of policy in that state.

THE COMMISSION AND WESTERN FREIGHT RATES

THE Interstate Commerce Commission has denied the petition of the railways for a rehearing of the case involving advances in western freight rates. This is disappointing, as by this action the commission again, in effect, declines to pass on the question as to whether the net earnings of the western lines are adequate. Many persons will continue to believe that both the railways and the public were entitled to be told by the commission what conclusion it reached on this point. The data that were presented in its opinion seem to demonstrate the inadequacy of the roads' earnings, but as long as the commission dodges committing itself as to this matter neither the railways nor the shippers will know just where they stand.

At the same time that it refused to reopen the rate advance case, the commission took a step which seems commendable, important and significant. It issued an order on its own motion for a general inquiry into rates on live stock, dressed meat and packing house products in Western Classification territory. In its decision in the western rate advance case it refused increases in the rates on live stock because there were some state rates which already were lower than the interstate rates. The railways, in their petition for a rehearing, argued that it should have upheld the proposed interstate rates if they were reasonable and made the states advance the intrastate rates to the same basis. They contended that the action of the commission in letting rates fixed by state authority control its policy in regulating interstate rates was an abdication of the paramount authority of the federal government over interstate commerce. The issuance of the order for a general investigation of the rates on live stock and packing house products may mean that the commission intends to ascertain the exact relations which do exist between the rates, state and interstate, and then to take such action as may be necessary to eliminate existing discriminations.

That unfair discriminations in the rates on live stock and packing house products do exist is charged by many shippers and conceded by the traffic managers of most of the railways. Some of these disciriminations grow out of the fact that the state rates made by public authorities are lower than the corresponding interstate rates. Others grow out of the action of certain railways in making interstate rates which are unduly low as compared with other rates in the same territory. The investigation on which the commission is entering will enable it to determine what are the extent and nature of the existing discriminations.

It is not charged that any of the discriminations now alleged grow out of the fixing of any rates that are too high. They grow out of the fixing by state authorities and by the railways themselves of some rates which are too low. If the commission decides that this is the situation, how will it proceed to remedy it? The act to regulate commerce gives it authority to reduce interstate rates and prevent advances in them in order to prevent excessive charges or remedy unfair discriminations; but it does not give it express authority to require an advance in any rate, state or interstate, or to prevent a reduction in any rate. Members of the commission have contended that it should be given authority to fix minimum as well as maximum rates. Many railway men and economists have taken the same view. The *Railway Age Gazette* long has advocated legislation empowering the commission to fix minimum rates. It seems highly probable that one of the main results of the investigation just ordered will be the disclosure of a situation arguing unanswerably for legislation empowering the commission to fix minimum rates; and another important result is likely to be the disclosure of facts demonstrating that the commission cannot deal effectively with interstate commerce without exercising authority over the activities of state regulating bodies.

BALTIMORE & OHIO

A YEAR ago four men out of five, not officers of the Baltimore & Ohio, who had been following that company's monthly earnings fairly closely, would have said that there was hardly a chance for the Baltimore & Ohio to earn its 5 per cent dividend in the fiscal year ended June 30, 1915. It earned that dividend with a margin of $771,000. The optimism of a year ago of the Baltimore & Ohio officers was a considerable factor in the success which has been achieved.

Operating revenues in the fiscal year ended June 30, 1915, amounted to $91,816,000, a decrease as compared with the previous year of $7,348,000, or 7.41 per cent. Operating expenses amounted to $63,926,000 in 1915, a saving of $10,478,000, or 14.08 per cent, and of this saving almost exactly half, or $5,731,000, was in transportation expenses, and of the remainder $2,112,000 was a saving in maintenance of way, which represents the difference between the normal expenditures in a normal year —1915—and in 1914, when so much replacement work had to be done after the unprecedented floods. Income from rent, interest and other sources not directly connected with the operation of the road showed a decrease of $873,000, and interest charges and hire of equipment an increase of $655,000, so that of the $3,056,000 increase in operating income due to the proportionally larger decrease in expenses as compared with loss in revenues, there was $1,523,000 saved for net available for common dividends, making the total in 1915 $8,368,000. Five per cent dividends on the common call for $7,597,000.

For the first time since 1909 the Baltimore & Ohio's operating ratio was below 70. In 1910 total operating expenses amounted to $63,196,000 and the operating ratio was 70.09; in 1915 total operating expenses amounted to $63,926,000 and the operating ratio was 69.62. The ton mileage handled in 1910 was 12,024,584,000; in 1915, 12,415,384,000. The passengers carried one mile in 1910 were 763,449,000; in 1915, 714,368,000. Since 1910 there have been increases in wage schedules of all classes of employees in train service ranging from 5 to 15 per cent. The cost of wages of enginemen and firemen per 100 miles was $8.66 in 1910 and $10.61 in 1915; the cost of engine house expenses per 100 miles was $1.78 in 1910 and $2.40 in 1915; the cost of fuel per 100 miles was $8.16 in 1910 and $9.63 in 1915; the cost of water per 100 miles was 60 cents in 1910 and 87 cents in 1915. The total cost of transportation expenses in 1910 was $29,739,000, and in 1915 $34,255,000; but net operating income in 1910 was $26,968,000, and in 1915 $27,890,000. Interest charges in these five years have increased from $14,938,000 to $22,428,000; in other words, about the same amount of business was handled in 1915 as in 1910, with a materially higher wage schedule in effect, and still the management was able to show a slightly larger net operating income in 1915 than in 1910; but this result was achieved only through the expenditure of additional borrowed capital, the interest charges on which amount to between seven and eight million dollars. In other words, with a slightly smaller net operating revenue in 1910 than in 1915 the owners of the property had a profit of $15,832,000 in 1910 and $10,723,000 in 1915.

The somewhat extended comparison with 1910 is worth while because it is essential to keep it in mind while studying the results obtained on the Baltimore & Ohio in 1915 as compared with 1914. The showing made in the reduction of expenses this year as compared with last year is so brilliant that if this showing is not kept in proper relation with the history of the railroad company's operations over a period of years it will give a quite wrong impression of the factors which go to make up the present railroad problem.

The saving of $5,731,000, or 14.33 per cent, in transportation expenses, with a decrease of 7.71 per cent in ton mileage and 13.65 per cent in passenger mileage, is the combined result of the economies which come from improved facilities and the economies which come from a more effective effort of the individuals that go to make up an organization through the improvement in the organization itself. As an example of the first class, the completion of the Magnolia cut-off has made it possible to increase the eastbound slow freight trainload to 6,180 gross tons, an increase of 36.36 per cent. The importance of this Magnolia cut-off may be in part understood by the fact that the freight density on the line between Patterson Creek, W. Va., and Cherry Run, 57 miles, is over 24,000,000 ton miles per mile of road. As an example of the second class, it might be pointed out that by the end of the fiscal year the actual results being obtained on the Cumberland division averaged above 90 per cent of the theoretically perfect train loading and wage costs.

Some of the detail accounts under transportation expenses are worth mention. Wages of train enginemen in 1915 amounted to $4,730,000, a decrease of $980,000; fuel for train locomotives cost $4,850,000, a decrease of $788,000; wages of trainmen amounted to $4,703,000, a decrease of $785,000; wages of yard conductors and brakemen amounted to $2,160,000, a decrease of $540,000; loss and damage to freight cost $1,177,000, a decrease of $424,000.

The average revenue trainload in 1915 was 692 short tons as compared with 645 short tons in 1914. The percentage of loaded car mileage to total car mileage was 61.16 in 1915 and 63.24 in 1914. The average tons of freight per loaded car was 27.44 in 1915 as against 26.97 in 1914. The average length of haul per ton was 201 miles in 1915 and 194 miles in 1914. A larger proportion of bituminous coal moved east in 1915 than in 1914. This gave a longer average haul and also gave a better average ton-mile rate. The ton-mile rate on coal in 1915 was 3.77 mills as against 3.76 mills in 1914. The average ton-mile rate on traffic other than coal was 7.10 mills in 1915 and 7.16 mills in 1914.

The total tonnage of freight handled by the Baltimore & Ohio in 1915 was 64,376,000 tons. Of this, 29,618,000 tons, or 46.01 per cent, was bituminous coal. This compares with 34,105,000 tons of bituminous coal carried in 1914, forming 47.19 per cent of the total tonnage of that year. On the other hand, the tonnage of agricultural products totaled 4,191,000 tons in 1915, or 6.51 per cent of the total tonnage, comparing with 3,523,000 tons carried in 1914, or 4.88 per cent of the total tonnage of that year.

Maintenance of equipment cost $16,003,000 in 1915, a decrease of $1,147,000. This is a decrease of 6.69 per cent and compares with a decrease in locomotive mileage of 9.5 per cent; of freight car mileage of 6.2 per cent, and of passenger car mileage of 4.8 per cent. There was possibly room for economies in the mechanical department in 1914 and the reduction in maintenance of equipment expenses in 1915 probably represents in part the efforts of the department to make these economies effective.

The Baltimore & Ohio spent $3,745,000 for additions and betterments to road and $4,232,000 for additions to equipment. The net increase in the outstanding securities was $3,992,000. The company had $16,718,000 cash on hand at the end of the year and total current assets, including this cash, of $35,348,000. There were no loans and bills payable, and total current liabilities amounted to $17,810,000.

The following table shows the principal figures for operation in 1915 as compared with 1914:

	1915	1914
Average mileage operated	4,535	4,515
Freight revenue	$70,780,809	$76,398,717
Passenger revenue	14,059,940	15,889,991
Total operating revenues	91,815,797	99,164,010
Maintenance of way and structures	8,985,627	12,418,435
Maintenance of equipment	16,002,589	17,149,775
Traffic expenses	2,905,496	2,152,826
Transportation expenses	34,254,572	39,895,496
Miscellaneous expenses	557,613	561,246
General expenses	2,228,274	2,135,609
Transportation for investment—Cr.	8,663	.....
Total operating expenses	63,925,508	74,403,389
Taxes	3,289,611	3,236,881
Operating income	24,581,697	21,523,741
Gross income	29,842,545	27,657,158
Net income	10,780,881	9,250,024
Reserves	57,633	49,457
Dividends	9,951,774	11,473,397
Surplus	771,474	*2,272,830

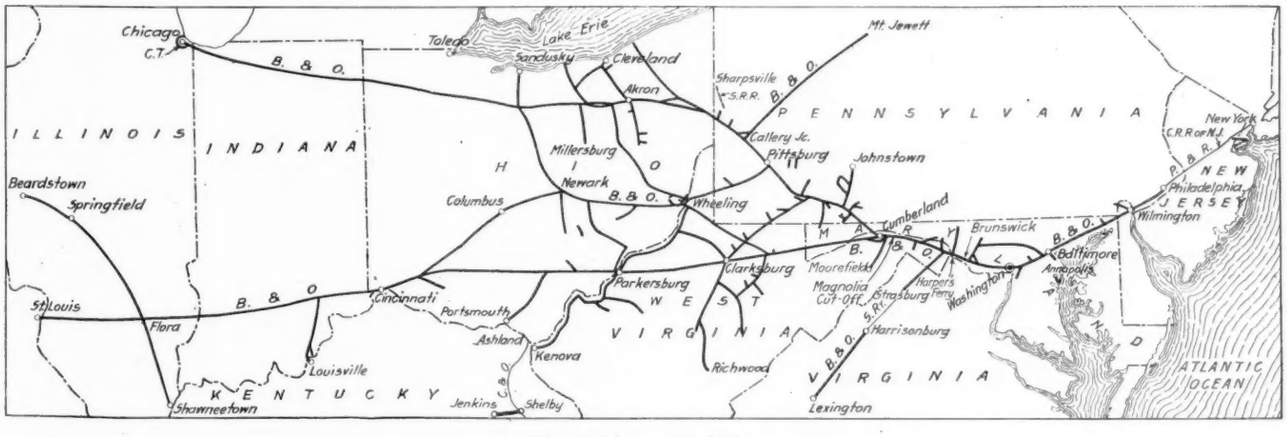
*Deficit.

PERE MARQUETTE

SELDOM, if ever, has there been a more drastic and thoroughgoing attempt to operate a bankrupt railroad economically than that made by the receivers and officers of the Pere Marquette in the fiscal year ended June 30, 1915. In the previous fiscal year the receivers showed a loss from operation, before the payment of interest, charges, rentals or taxes, of $1,119,000. In 1915 the net operating revenues amounted to $4,584,000, a difference as between the two years of $5,703,000, accounted for by an increase in revenues of $1,113,000 and a decrease in the expense of handling the business and of maintaining the property of $4,590,000.

The Pere Marquette operates 2,322 miles of road. The company has been in receivership since 1912, having taken over the property from a former receivership in 1907. If it were probable that the company could make as good a showing over a series of years as it did in the fiscal year ended June 30, 1915, and could count on an increase in net proportional to the normal increase in gross, there might be some ray of hope for some classes of securityholders. It may be that such a showing will be possible, but the figures for 1915 do not conclusively demonstrate this.

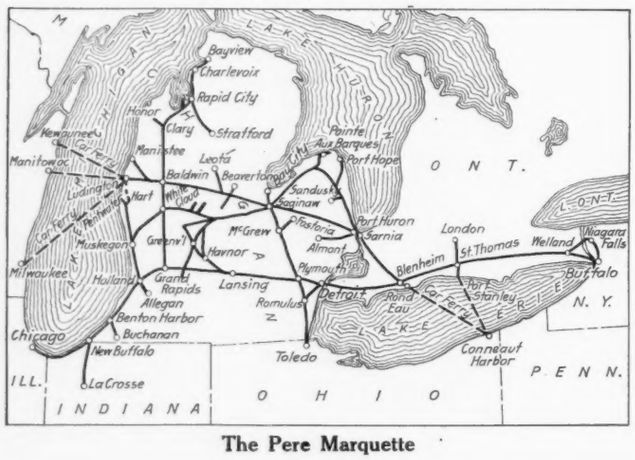
Full credit is due to the operating officers for the remarkably good showing which is made in transportation expenses. Revenue ton mileage carried totaled 1,967,000,000, an increase of 158,000,000 ton miles, or about 8.8 per cent. Passenger mileage



The Baltimore & Ohio

amounted to 199,700,000, a decrease of about 3.5 per cent. Transportation expenses amounted to $7,023,000, a decrease of 7.6 per cent. The average trainload of revenue freight was 498 tons in 1915, as against 459 tons in 1914. The passenger-train mileage was 3,643,000 miles, a decrease of about one per cent. There was an increase in the empty car mileage of 26.12 per cent, partly due to the routing of empty cars over the Pere Marquette by other roads which preferred to avoid paying per diem rather than hold the cars for loads, and the efforts of the Pere Marquette itself to get rid of its foreign cars. Under these conditions, especially the two noted—that of only a very slight cutting down of passenger service and the much heavier empty freight car movement—a saving of 7.6 per cent in transportation expenses is well worth comment.

The saving was made primarily because of the interest which was aroused in all classes of officers and employees in the efforts of the management to make the best possible showing. There was a large saving in fuel cost, ascribed partly to more economical buying and partly to greater efficiency in consumption, a part of the credit for the latter saving being given to the fact that a larger number of superheater locomotives were in service during 1915 than in 1914. The energy and ingenuity of everybody have been directed to making large or small savings. Local freight train service has been reduced without, it is thought, inconveniencing the shippers; both station expenses and train supply expenses have been zealously guarded, and the results speak for themselves. Paul H. King is the operating receiver and his co-receiver is W. E. Waters. In their report they especially express their appreciation of the work done by the general officers and conclude their report as follows: "Personally it has never before been our pleasure to be associated with men more interested in the work at hand, more untiring in their efforts, or more loyal to the property they all serve, and



The Pere Marquette

the showing which we have been able to make during the year was largely due to their efforts."

For all the substantial and praiseworthy success which has been made in reducing transportation expenses only about one-fifth of the total saving in expenses was made in this account. Maintenance of way and structures cost $2,000,000 in 1915, a decrease as compared with the previous year of $996,000, or 33 per cent, and maintenance of equipment cost $3,493,000, a decrease as compared with the previous year of $2,995,000, or 46 per cent. While it is undoubtedly true, as the receivers point out, that a large part of the maintenance of equipment and a certain part of the maintenance of way expense reductions were due to the fact of abnormally high expenditures in 1914, it is by no means conclusively demonstrated that the 1915 rate of expenditures for maintenance can be continued without detriment to the property. In 1915 maintenance of way and structure expenditures averaged $864 per mile operated. Under present conditions of operation, with the necessity for heavy rails, ballast, etc., and probable cost of track labor, $864 appears to be considerably less than will be required on an average over a series of years for maintenance of way and structures. Repairs per locomotive in 1915 cost $2,828; per passenger-train car, $535, and per freight-train car, $66. These figures for repairs of equipment are not so low as to preclude the possibility of keeping them at about this rate. On the other hand, they are not high enough to permit of any probable further reduction, and if further economies in transportation expenses are to be effected, considerable sums will have to be charged to expenses for retirement of equipment, the company having 48 eight-wheel locomotives and 50 Mogul locomotives of light tractive power. The principal freight power is made up of 166 Consolidations, with 10 Mikados as the only modern heavy freight engines.

It is impossible to give even an adequate summary of the quite unusually comprehensive report made by the receivers. It is recommended, however, that any one who is interested in the question which is of so vital importance at present—the interfering state and federal regulation of railroads—read the report of the officers of the court who are administering the affairs of a railroad which has been largely at the mercy of state regulation.

The following table shows the principal figures for operation in 1915 as compared with 1914:

	1915	1914
Average mileage operated	2,314	2,324
Freight revenue	$12,562,523	$11,435,126
Passenger revenue	3,938,086	3,912,186
Total operating revenues	18,028,210	16,915,198
Maintenance of way and structures	2,000,282	2,996,118
Maintenance of equipment	3,492,973	6,487,963
Traffic expenses	379,126	411,910
Transportation expenses	7,022,741	7,596,675
Miscellaneous expenses	53,045	63,344
General expenses	500,859	478,163
Transportation for investment—Cr.	5,011	.....
Total operating expenses	13,444,014	18,034,174
Taxes	512,844	643,168
Operating income	4,071,352	*1,762,145
Gross income	4,265,890	*1,577,108
Deficit	1,419,265	7,152,895

*Deficit.

NEW BOOKS

Investors and Money-Makers. By F. W. Taussig, Henry Lee Professor of Economics, Harvard University. Published by the Macmillan Company, New York.

This little book of 138 pages gives the substance of lectures delivered at Brown University in celebration of the one hundred and fiftieth anniversary of the university's foundation. The lectures cover a much broader field than would be suggested by the title. The relations between the workman and the employer, between the individual and society, and between the desire for individual gain and the desire to be of service to the community as a whole are discussed in a searching but common sense way which makes unusually interesting reading. Professor Taussig, while sympathizing with the views of the workman and with his limitations and understanding his difficulties discards entirely the sentimental in his discussion. He shows clearly that it is the desire for personal gain which is the motive power behind the actions of people in the great majority of cases. He believes that the present economic organization, while tending to stimulate the instinct of contrivance, which is the instinct that is exercised by the inventor in the capitalist employer, often smothers it in the hired laborer. He recognizes that the individualistic system turns an inborn bent to the contriving of those things which are of general service; but he believes that something of the same result could be obtained in a collectivist society. He believes, however, that deliberate regard for general welfare is within the possibilities of a private business as well as a public. He cherishes no expectations of a radical change in our present economic system, but is hopeful that present tendencies will correct the worst abuses of this system and develop the feeling of interindependence and of responsibility on the part of the individual to society as a whole.

Mikado Versus Consolidation Locomotives

A Study for the Purpose of Determining the Economical Distribution of Power from a Net Revenue Standpoint

By N. D. Ballantine

Assistant to Chief Operating Officer, Rock Island Lines

For the purpose of determining the relative merits of the Mikado and Consolidation locomotives on certain divisions of the Rock Island, a study was made under practical operating conditions, which showed, among other things, where a given number of locomotives of each type could be used to the best advantage from a net operating revenue standpoint. The month selected for the study was during a period of heaviest traffic, when there was a constant demand for power; the data was tabulated subsequent to the performance, and none of the division officials knew that such a study was to be made, hence the freedom from chances for preferential handling of either class of power. The records made currently were tabulated and carefully checked against train sheets, train registers, roundhouse registers, work sheets and fuel tickets. Every practical means was used to secure correct information. There are some apparent discrepancies with respect to the maintenance features, which it is thought were due to the fact that the Mikado locomotives were practically new, there being no question about the expense for heavy repairs made during such a limited time not being as correct a basis as it would be if a year's figures were used. These being the only figures available, they were used, and as they are clearly set out, one can accept or ignore that portion of the study if desired.

TABLE A—LOCOMOTIVE UTILIZATION, OR A TIME STUDY SHOWING DAILY AND OTHER AVERAGES

	Division A		Division B		Division C		Division D		Averages	
	Mik.	Cons.	Mik.	Cons.	Mik.	Cons.	Mik.	Cons.	Mik.	Cons.
Time under mechanical department (hr. and min.)	9-11	9-18	8-54	9-6	10-39	10-43	9-42	8-15	9-53	9-8
Time at terminals (hr. and min.)	6-42	5-18	7-22	7-18	3-25	3-11	7-12	7-34	5-37	6-8
Time between terminals (hr. and min.)	8-7	9-24	7-44	7-36	9-56	10-6	7-6	8-11	8-30	8-44
Actually running, hr. and min.	5-5	6-6	5-47	5-46	6-25	6-51	5-30	6-23	5-56	6-25
Meeting trains, hr. and min	1-31	1-46	1-6	0-55	1-30	1-25	0-58	0-56	1-16	1-9
Station work, hr. and min	0-21	0-37	0-38	0-34	1-6	0-49	0-23	0-33	0-40	0-38
Track conditions, hr. and min	0-3	0-1	0-2	...	...	...	...	0-1	0-1	...
Block signals, hr. and min	0-1	0-1	...	...	0-6	0-4	...	...	0-3	0-2
Engine failures, hr. and min	0-1	...	0-2	0-5	...	...	0-2	0-3	0-2	0-1
Car failures, hr. and min	0-9	0-3	0-5	0-4	0-11	0-4	0-1	0-3	0-7	0-3
Miscellaneous, hr. and min	0-56	0-50	0-4	0-12	0-38	0-53	0-12	0-12	0-25	0-26
Total time—hours	24	24	24	24	24	24	24	24	24	24
Speed between terminals (m. p. h.)	10.7	11	15.9	18	13.6	14.6	14.5	14.5	14	14.7
Speed actually running (m. p. h.)	17.1	17.1	21.2	23.6	21.2	21.7	18.7	18.6	20.2	20
Delays per 100-train miles, meeting trains (hr. and min.)	1-44	1-43	0-53	0-42	1-11	0-57	0-57	0-79	1-36	0-53
Delays per 100-train miles, station work (min.)	24	34	29	25	45	33	18	27	33	29
Gross ton miles per day	130800	121669	174109	123997	273780	223980	151373	130193	205600	154600
Gross ton miles per hour (actually running)	25700	20077	30010	21452	42644	32698	27522	19739	34730	24081

The study covers the performance in freight service other than local or way freights and work trains on four divisions for 31 days of the same month, of 27 Mikado superheater locomotives of 57,000 lb. tractive power, making 71,000 miles, and 59 Consolidation saturated steam locomotives of 39,000 lb. tractive power, making 116,275 miles. A total of 262,815,000 gross ton miles was handled, of which the Mikados were responsible for 48 per cent.

No attempt was made to include or compare the expense of maintenance of way and structures, general expenses, supervision, station service, yard service, train supplies, loss and damage and a number of other factors in operating expenses, a variation of which would not be appreciably affected by the class of power handling it. The items included do not purport to represent the total actual cost of handling traffic, but it is thought they include the essential variable items that can practically be located and that are of sufficient importance to justify their inclusion in a study which does not contemplate a degree of refinement in costs to produce figures accurate to the fifth or sixth decimal part of a cent.

In tabulating the data for our own use, it was separated to show the items in the *direction of traffic* for slow freights, fast freights; combined slow and fast freights; and slow and fast freights on the round-trip basis, the latter figures, for the sake of brevity, being used in this article. None of the divisions on which these locomotives were used have a very large percentage of their traffic of a low grade which will admit being held any considerable length of time for tonnage, the controlling business being made up of merchandise, live stock, packing-house products and perishable freight, which fact makes a study of this nature all the more necessary. The detail information as shown permits a variety of deductions to be drawn directly or by combinations, many of which will be apparent on inspection; a few of them will be pointed out, however.

Table *A* shows the locomotive utilization, and it is interesting to note the variation in the mechanical department detention on the various divisions. On three divisions it was less for the Mikados, and on the other division, where most of the Mikados were located, it was considerably more, averaging for all divisions 45 minutes more than for the Consolidations. The terminal delay varied from 3 hrs. 11 min. to 7 hrs. 34 min., depending on local conditions; but it is interesting to note that on the division where the greatest volume of traffic was moving, the terminal delay was the lowest for both classes of engines. The time between terminals varied from 7 hrs. 6 min. to 10 hrs. 6 min., averaging for all Mikados but 14 min. less per day than for all Consolidations. The actual running time varied from 5 hrs. 5 min. to 6 hrs. 51 min., averaging for all Mikados 29 min. less per day than for the Consolidations. The miles per hour between terminals varied from 10 hrs. 7 min. to 18 hrs. averaging 14 hrs. for the Mikados, or 0.7 m. p. h. less than the Consolidations. The miles per hour when actually running varied from 17 hrs. 1 min. to 23 hrs. 6 min., averaging 20 hrs. 2 min. for the Mikados, or 0.2 m. p. h. more than the Consolidations. The delays per 100 miles, meeting trains, varied from 42 min. for the Consolidations to 1 hr. 44 min. for the Mikados, averaging 1 hr. 36 min. for the Mikados, or 43 min. (equal to 81 per cent) more than for the Consolidations. This fact may or may not be due to longer trains, but as the 43 min. increase is more than 8 per cent of the total time between terminals for the Mikados, its significance should be studied more in detail. The average delay per 100 miles doing station work only varied 4 minutes.

The gross ton-miles per day varied for the Consolidations from 121,669 to 223,980, or 184 per cent, and for the Mikados from 130,800 to 273,780, or 210 per cent, while the average for all Consolidations was 154,600 and for the Mikados 205,600, or

33 per cent more than the Consolidations. It should be recalled that the Mikados have 46 per cent more tractive power. The gross ton-miles per hour when actually running varied for the Consolidations from 20,077 to 32,698, or 63 per cent, and for the Mikados from 25,700 to 42,644, or 66 per cent, while the average for all Consolidations was 24,081, and for the Mikados 34,730, or 44 per cent more than the Consolidations. It should be particularly noted that for the time the engines were *actually running* the increase in tons handled by the Mikados was within 2 per cent of the increase in its tractive power over the Consolidations, but by referring to the first part of this paragraph it will be noted that when compared with a *daily performance,* it is not within 13 per cent of its efficiency as compared with the Consolidations from a ton-mile standpoint.

TABLE B—PHYSICAL DATA

	Division A		Division B		Divison C		Division D		All Divisions	
	Mikados	Consols	Mikados	Consols	Mikados	Consols	Mikados	Consols	Mikados	Consols
Number of engines	2	13	4	9	14	15	7	22	27	59
Engine days	50	75	125	111	250	251	170	47	595	908
Locomotive miles	4358	7814	15402	15210	33762	37163	17478	56088	71000	116275
Locomotive miles per day	87	104	123	137	135	148	103	119	119	128
Gross ton miles	6544.5	9125.2	21763.7	13763.7	68445	56219.2	25633.4	61320.9	122386	140429
Gross tons per train mile	1500	1170	1413	904.2	2015	1470	1466.6	1093.3	1723	1207
Loading efficiency (per cent)	51.3	64.2	76.4	72	62	68	62.2	68.7	67	68.5
Number of trains	43	80	123	125	216	229	147	476	529	910
Average distance run (miles)	102	98	125	122	156	162	119	118	134	128

Table *B* indicates by divisions the number of locomotives, locomotive days, mileage and average miles per day, gross ton-miles and gross tons per train-mile, and loading efficiency. It will be noticed from the gross ton-miles produced that there is quite a difference in the volume of business handled on the various divisions; there was also a difference in the class of the traffic. It will be noted that on each division the Mikados made from 13 to 17 miles less per day than the Consolidations, the percentage for all Mikados during the entire period being 7 per cent less. It should also be noted that the division upon which both classes of locomotives made the highest mileage per day was that upon which the length of the average trip was the greatest. The distance between terminals generally has a very important bearing upon the miles per day locomotives make and that it increases with the distance between terminals is to be expected, as it decreases the roundhouse handling and yard terminal delays per 100 miles; hence, the importance of running locomotives through terminals or making turn-arounds if the power is in condition to permit this being done without unduly increasing engine failures.

The gross tons per train mile for the Mikados varied from 28 to 56 per cent more than that handled by the Consolidations; the average for all divisions is 43 per cent, or about 3 per cent less than the difference in tractive power, indicating that, as a whole, there was less loading efficiency obtained with Mikados than with the Consolidations.

This is reflected more clearly in the loading efficiency column which shows that Division *B*, while having but four locomotives, had a condition which enabled it to obtain a higher efficiency with the Mikados than on any other division, and this regardless of the fact that it also obtained a higher loading efficiency with the Consolidation locomotives than on any other division. It should be borne in mind that the figures given are for round-trips and an analysis of the figures covering only the *direction of traffic* may produce somewhat different results. In reality, it is *directional* figures which are of the most vital moment to the study, particularly where the traffic is unbalanced to an appreciable degree, high loading efficiency in the direction of traffic being a most significant figure to ascertain.

Table *C* gives the costs in cents per thousand gross ton-miles for the different items considered in this study. Interest at 6 per cent has been figured on the locomotives and cabooses, and depreciation at 5 per cent for the locomotives and 6 per cent for the cabooses. These figures per thousand gross ton-miles vary from 3.1 cents for the Consolidations on Division *C*, to 6.8 cents for the Mikados on Division *D;* for all Mikados it amounts to 4.8 cents, or about 12 per cent of the costs enumerated, while for all Consolidations it amounts to 4 cents, or 8.3 per cent of the costs enumerated. Special mention is made of this point for the reason that for certain purposes it is essential to include such items, while for others they probably should not be included; for example, if the question is one dependent on the type of new locomotives to be purchased, or the question of additional locomotives, it manifestly should be included; if, however, it is a question of once having the equipment and of determining the best location for its utilization, interest and depreciation will accrue regardless, and can as well be omitted for purpose of an immediate comparison. It will be noted the costs for the variables listed, run from 31 cents for the Mikados on Division *C* to 54.7 cents on Division *A*, and for the Consolidations from 39.9 cents on Division *C* to 58.3 cents on Division *B*, while for all Mikados it was 38 cents as compared with 48.3 cents for the Consolidations.

TABLE C—PRINCIPAL VARIABLE COSTS PER THOUSAND GROSS TON MILES IN CENTS

	Division A				Division B				Division C				Division D				All Div.			
			Inc. or Dec.				Inc. or Dec.				Inc. or Dec.				Inc. or Dec.				Inc. or Dec.	
	Mik.	Con.	Amt.	Percent	Mik.	Con.	Amt.	Percent	Mik.	Con.	Amt.	Percent	Mik.	Con.	Amt.	Percent	Mik.	Con.	Amt.	Percent
Coal	20.3	22.5	—22	9.8	15.4	20.3	—4.9	24.1	11.4	15.6	—4.2	26.9	13.6	18.0	—4.4	24.5	13.0	17.6	—4.6	26.1
Wages, train and engine crew	13.5	16.9	—3.4	20.1	13.2	20.9	—7.7	36.5	9.8	12.5	—2.7	21.6	13.4	17.4	—4.0	23.0	11.4	15.8	—4.4	27.8
Roundhouse charges	4.0	4.0	...	...	3.2	3.4	—.2	5.9	.2	.2	...	...	3.0	2.7	†.3	11.1	1.5	1.9	—.4	21.1
Water	1.5	1.7	—.2	11.8	1.3	1.5	—.2	13.3	.9	1.2	—.3	25.0	1.0	1.4	—.4	28.6	1.0	1.3	—.3	23.1
Lub. oils and waste	.3	.3	...	...	.2	.3	—.1	33.3	.8	1.2	—.4	33.3	.3	.3	...	...	.6	.7	—.1	14.3
Running repairs	6.6	2.4	+4.2	143.3	4.0	2.5	+1.5	60.0	2.2	2.1	+.1	4.8	5.9	3.5	+2.4	68.6	3.5	2.8	+.7	25.0
Classified repairs	2.0	3.6	—1.6	44.4	2.1	4.7	—2.6	55.3	1.9	4.0	—2.1	52.7	2.6	4.5	—1.9	42.2	2.1	4.2	—2.1	50.0
Int. on locomotives at 6 per cent	3.3	2.4	+.9	37.5	2.5	2.3	+.2	8.7	2.0	1.6	+.4	25.0	3.6	2.5	+1.1	44.0	2.5	2.1	+.4	19.0
Int. on cabooses at 6 per cent	.1	.1	...	...	.1	.1	...	...	.1	.1	...	...	.1	.1	...	...	.1	.1	...	...
Depreciation loco. at 5 per cent	2.8	2.0	+.8	40.0	2.1	1.9	+.2	10.5	1.6	1 3	+.3	23.1	3.0	2.0	+1.0	50.0	2.1	1.7	+.4	23.5
Depr'ction cabooses at 6 per cent	.1	.1	...	...	.1	.1	...	...	.1	.1	...	...	.1	.1	...	...	.1	.1	...	...
Totals	54.7	56.0	—1.3	2.3	44.7	58.3	—13.6	23.3	31.0	39.9	—8.9	22.3	46.6	52.7	—6.1	11.6	38.0	48.3	—10.3	21.3

A glance at Table *A* might cause one to feel that the proper place to put the Mikados would be where they would produce the most gross ton miles per day or hour, in which event it would point to Division *C*, as on this division they produced 273,790 gross ton miles per day, or 42,644 gross ton miles per hour when actually running. What we are trying to determine, however, is whether it is more economical to keep the Mikado on a particular division as opposed to another division. Let us compare Divisions *B* and *C*. By referring to Table *C* and Division *C* it is noted the cost per 1,000 gross ton miles is 8.9 cents less for the Mikados than for Consolidations, and as the Mikados produce 273,790 gross ton miles per day, this is equivalent to their saving $24.36 per day, while by referring to Division *B*, it will be noted

the Mikados save 13.6 cents per 1,000 gross ton miles, which with the 174,109 gross ton miles they produce per day, makes a saving of $23.68, a difference of only 68 cents in favor of Division *C*. As previously referred to, however, the maintenance feature was known to be a little uncertain, and inspection indicates the running and classified repairs on Division *B* was 6.1 cents as against 4.1 cents on Division *C*, or nearly 50 per cent more. With such a wide difference in this item, it would not be unfair to average the two, or eliminate the feature; in either of which events, it will indicate that the greatest saving per day can be effected on Division *B*.

A knowledge of local conditions is, of course, an advantage in making such an analysis, as in this particular instance it is known that with the volume of traffic moving on Division *B*, and the necessity for protecting local work, it would not be economical to place any more Mikados on that division under present traffic conditions. The above analysis indicates in this specific case, economy in operation to use a Mikado locomotive on a division where it will not produce within 65 per cent of the ton miles which it produces on another division, a condition which will doubtless appeal to many as an anomaly.

In this connection there might also be pointed out the relation existing between handling tonnage with large versus small power when the train mile unit is used. It is frequently considered by some, that increasing the size of power and being able to utilize it as efficiently as the smaller power, thus reducing train miles, will bring about a reduction in expenses equivalent to the *cost of a train mile* saved; but that this is a fallacy, can, I think, easily be pointed out from the data contained in the above tables. For example, the costs on Division *A* per 1,000 gross ton miles for the Mikados were 54.7 cents, the average tons per train were 1,500, therefore the cost per *train mile* was 82 cents. The cost for the Consolidations per 1,000 gross ton miles was 56 cents, the average tons per train was 1,170, therefore the cost per train mile was 65.5 cents. Here there was an increase of 330 tons in tons per train mile with an increase of 16.5 cents in the cost per train mile. Inasmuch as the Mikado handles 330 tons more than the Consolidation it will take 3.55 Mikado trains to save one Consolidation train mile. Inasmuch as each Mikado train costs 16½ cents more per train mile than the Consolidation the product of 16½ x 3.55 equals 58.5 cents, or 7 cents less than the cost for a Consolidation train mile. In other words, the real saving per *train mile* is 7 cents instead of 65½ cents as might be roughly estimated.

When such a narrow margin of saving exists as shown in this case, it is worth while investigating the matter very carefully, considering another factor, namely the interest on "additions and betterments" which were necessary to *especially* provide for the Mikados' repairs, housing, turning and their safe movement over the road. The feature of "additions and betterments" is one which should always be taken into account when considering change from small to large units; after they have once been made, as there is no way to get away from the interest charge thereon, it is of course, unnecessary to consider them if the two divisions to be compared have the necessary facilities; if, however, one division has the facilities and the question arises about transferring some of its power to another division which is not provided with the facilities, then in order to determine the propriety of switching a given amount of power to such division the determination should be made upon the new division's economy including interest on "additions and betterments" versus the equipped Division's economy, *excluding* the interest on those expenditures already made.

Consideration of the effect upon maintenance of way and structures due to the use of the larger locomotives has been purposely avoided, for the reason that it is still a moot question among engineers. The above study should indicate that a variety of angles exist from which to approach this subject, as well as the importance of having the detail information such as is set forth currently prepared. Unless it is prepared currently, much of it is impractical to secure and thus precludes a definite knowledge of many vital items. Also, in making any such study the actual traffic conditions must be carefully considered.

BUREAU REPORT ON ARDMORE EXPLOSION

Colonel B. W. Dunn, chief inspector of the railroads' Bureau of Explosives, has issued Special Bulletin No. 2, giving the results of his investigation of the explosion of gasolene at Ardmore, Okla., September 27, when 39 persons were killed and several scores injured, and when property was destroyed to the extent of $500,000 to $1,000,000. The action of President Ripley, of the Atchison, Topeka & Santa Fe, in offering to pay for the damages, though not accepting responsibility on behalf of the road, was noticed in the *Railway Age Gazette,* October 15, page 703.

Colonel Dunn says that the accident was caused by the escape of a large quantity of inflammable vapors from a tank car "whose lading was billed as gasolene," this being due in part to insufficient space in the top of the tank for the expansion of the liquid. The gasolene was loaded at a temperature of 50 deg. F., while the temperature at Ardmore for two days, while the car had been standing on a side track there, was 93 deg. in the shade.

The immediate cause of the disaster, however, was the removal of the dome cap of the tank car by an employee of the consignee, while the tank was subjected to interior pressure. Such removal is forbidden by the government regulations. The bureau has records of five serious accidents (not explosions) in the past four years from this cause. The safety valves on the car at Ardmore had shown the existence of interior pressure by their continual popping, and the railroad called for a man from the refinery of the consignee to take charge of the car. This man, in consequence of ignorance or carelessness, neglected to cool the car before taking off the cap; and he paid the penalty with his life. The regulations say that tank cars in cases like this must have at least 2 per cent vacant space; and in this case the outdoor temperatures were so high that probably more than 2 per cent was needed, but the actual space left when the tank was loaded was not much over 1 per cent.

Colonel Dunn gives no details of the exact cause or nature of the explosion or explosions; and, indeed, he says that heretofore errors of this kind have resulted in serious fires, but not in explosions. In this case the first explosion occurred about one minute after the man had taken off the cap and had descended to the ground.

The report recommends the distribution of the bulletin among railroad officers and employees, for information, and the careful instruction of employees in all the rules, but says that beyond that no special instructions are needed at this time. Proposals to change the rules will, however, be taken under consideration. Special insulated tank cars are now prescribed for any product with a vapor tension exceeding 10 lb. per square inch; and Colonel Dunn recommends shippers to provide themselves with these cars. Those who have used them are more than satisfied with their service; they prevent losses during transit, and these losses, with ordinary cars, have been considerable.

LIQUID FUEL ON ROUMANIAN RAILWAYS.—For the past few years the consumption of liquid fuel on the Roumanian railways has been steadily increasing, and though the figures of consumption for the past year do not reach those for the preceding 12 months, it must not be inferred that the use of oil fuel for the Roumanian State locomotives has reached its zenith. As a matter of fact, the opposite is the case, for the decrease for the past 12 months in the consumption is explained by the reduced traffic upon the lines owing to the European war. During the 12 months the engines consumed about 198,000 tons, which is a decline of just over 6,000 tons when compared with the figures for the preceding 12 months. To-day no less than 85 per cent of the locomotives on the Roumanian railways use liquid fuel in preference to coal, there being 751 engines regularly using oil out of a total of 873 working on the various State railways. The value of the consumed oil for the past 12 months is estimated at $1,300,000, admittedly a low figure, yet due to forward contracts for supply having been made by the state.

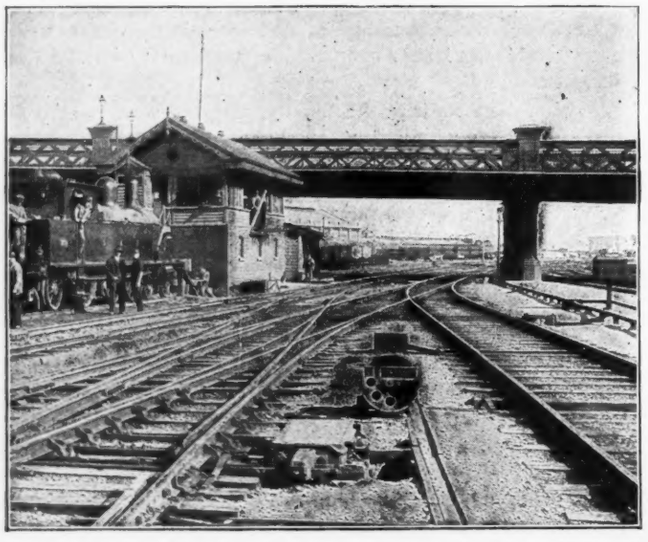
Electric Interlocking at Adelaide, South Australia

First Use of Speed Signaling and Three-Position Upper Quadrant Indications in the Southern Hemisphere

By C. G. Pilkington

Engineer for Signals and Yards, South Australian Railways

The recent enlargement of the passenger terminal of the South Australian Railways at Adelaide, South Australia, made necessary by a rapidly increasing suburban traffic in this important south coast city, involved an increase in the number of platforms from 6 to 13, extensive changes in the track layout, and the duplication of main lines from Adelaide Wye to the terminal station. These changes required a complete revision



Terminal Yard Cabin; Three-Position Dwarf Signal in the Foreground

of the terminal yard interlocking, which consisted of 67 mechanical levers, and also of the South Line Junction mechanical plant, containing 42 levers. This latter plant and a similar one at Torrens Bridge Junction, with 35 levers, controlled the two legs of Adelaide Wye.

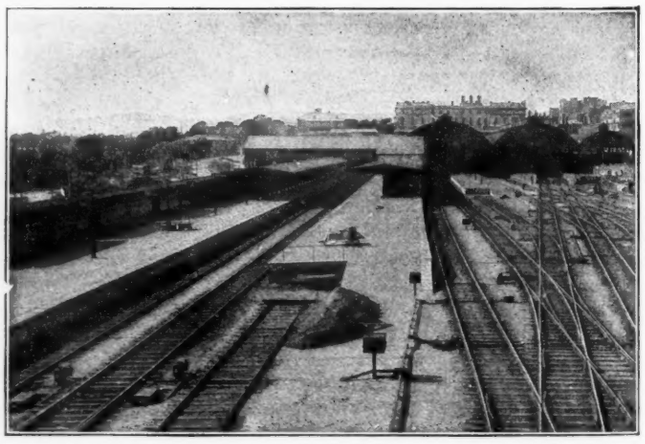
The cramped position of the yard interlocking and lack of space for mechanical connections practically precluded the extension of the mechanical frame to handle the final layout, and electro-mechanical working offered practically no better solution. The matter finally resolved itself into a question of straight power interlocking, and after careful consideration of the various types, the General Railway Signal Company's dynamic indication, all-electric system was selected as being best adapted to conditions, and an apparatus of 100 levers and 36 spare spaces was installed.

Since these changes would require the rebuilding of the South Line Junction plant, it was found that one power plant between the two junctions at the Wye, replacing both mechanical plants, would effect a substantial saving through the reduction in operating expenses, which, capitalized, would more than pay for the cost of the installation of the power scheme. Accordingly it was decided to install a second machine of the same type at the Adelaide Wye, consisting of 43 levers and 13 spare spaces. These installations are unique in that the South Australian Government Railway management is a pioneer south of the "line" in using all-electric interlocking, speed signaling, the three-position upper quadrant signal with yellow light for caution, and permissive automatic signals.

INSTALLING A NEW SYSTEM

Scheme No. 3 of the Railway Signal Association's recommendation for speed signaling was adopted. This gives adequate information to the enginemen; it reduces the signal arrangement to two combinations of arms for the absolute signals and two combinations of arms for the permissive signals, and finally, because of this simplicity, it makes an economical installation. It should be understood here that the signal practice, as well as the railway methods as a whole, were up to this installation patterned after the British Board of Trade requirements. British signal practice, of course, is based on route signaling, and under the old arrangement at the station, at least one of the inbound lines to the station had six arms, or one for each platform. Therefore, to continue this scheme for the three approach mains either meant nine or ten arms for each signal location, or the use of three signals with route indicators below the arms, giving the platform number.

Hence, after careful study and discussion between the operating and the engineering branches the officers of the former declared themselves willing to try the American scheme of upper quadrant speed signaling and the yellow light for "caution." As the old scheme required the use of only two lights, red and green, it will be apparent that this was a decided revolution for

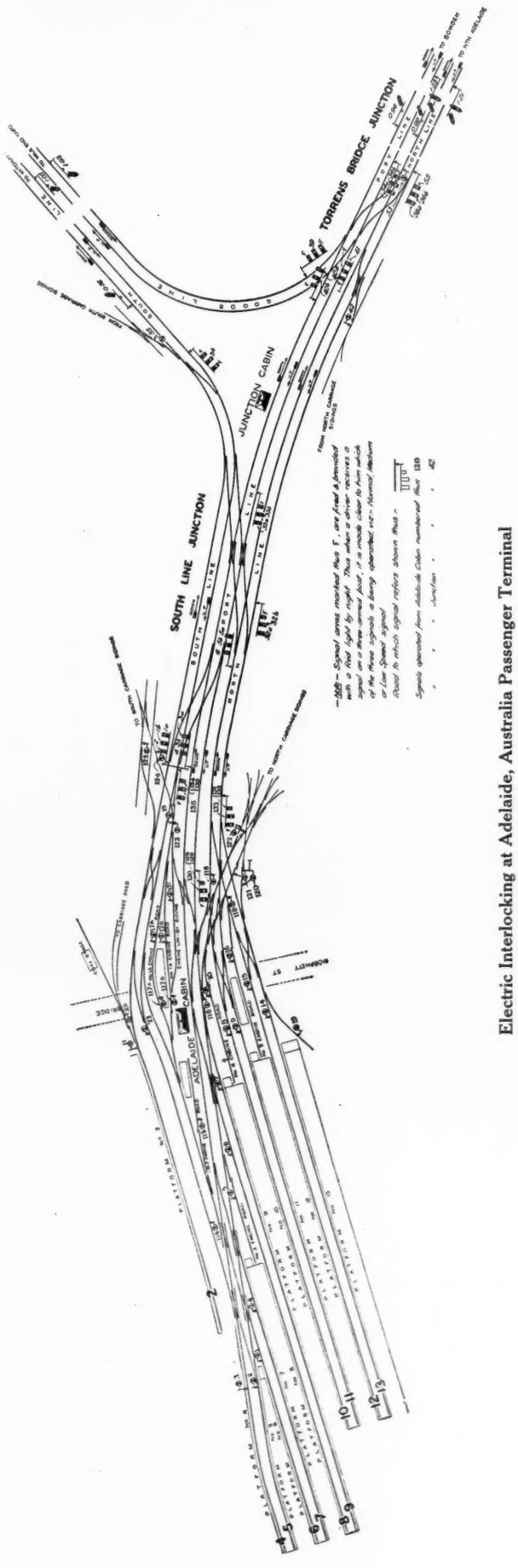


Station Platforms and Tracks from Morphett Street Bridge

the operating branch, and meant discarding everything except the red light and horizontal position of the arm for "stop" and the green light for "proceed." The top or normal speed arm indicates the authorized speed for the vicinity; the medium speed arm indicates 15 miles an hour (it was the desire to make this 20 miles an hour, but it was necessary to limit it to 15 on account of the general use of 1 in 8 compounds); and the low speed arm indicates 10 miles an hour.

A signal diagram about 13 ft. long showing the yard and Wye was made and fastened to a large table in a building adjacent to the yard cabin. Small working models of the various signals about 10 in. high were furnished and the two head signalmen in the yard cabin took turns instructing classes of the enginemen and guards. The men having been previously furnished with copies of the rule book, were required to arrange the signal indications for imaginary train moves through both plants. That this time was well spent was proved after the plants went into service, for so far as is known no delays or confusion resulted from the enginemen not being able to grasp the new indications promptly.

Although the absolute block had been consistently maintained prior to the new signaling, and the rules required trains to come to a full stop before passing a horizontal distant signal arm, the enginemen soon saw the advantage of the permissive auto-



Electric Interlocking at Adelaide, Australia Passenger Terminal

matic signals which took the place of the starting and distant signals, and proper observance of these permissive signals has materially expedited traffic during the rush hours. Absolute lock and block is maintained between all cabins, but the installations between yard cabin, South Line Junction, Mile End, Torrens Bridge, Bowden and North Adelaide were removed and automatic signals, with continuous track circuit, without manual control, were installed.

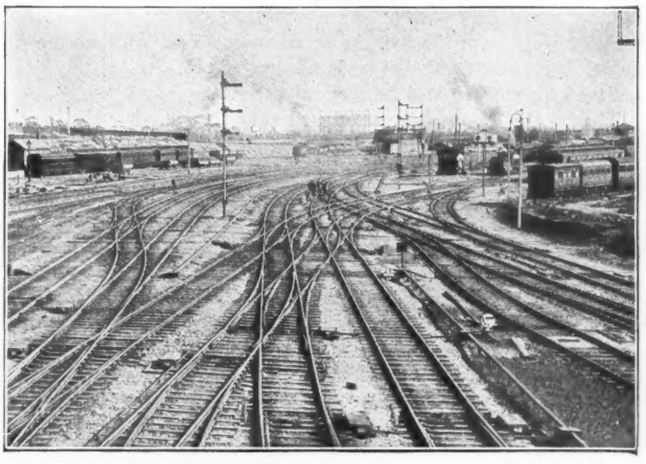
CABINS

The existing yard cabin, being a substantial building and in a most suitable position, was used; but the depth of the power machine is less than 3 ft. and it was set up on the same floor and parallel with the mechanical machine. This made it easy for the signalmen to pass from the old to the new when the plant went into service.

The Wye cabin is a new brick building, built on the edge of the embankment with the battery room in the basement, relay room and power board on the first floor and operating room on the second floor. The location is such as to give an uninterrupted view of the three legs of the Wye. Both machines are of the G. R. S. multiple unit type.

SIGNALS AND SWITCHES

The incoming signals at the yard plant for the three mains—North, Port and South—are Model 2-A three-arm posts, one



Terminal Yard from Morphett Street Bridge, Looking Toward the Junction

of which is placed on the signal bridge with the Wye signals. As the station is dead end, the top arms are immovable, and the medium speed arms, which are semi-automatic, stick, work from 0 deg. to 45 deg. only. The "calling on" or lower arms work in two positions also and are controlled by two levers. One of these levers controls movements into the platforms when occupied, and the other lever is used for a movement into the coal stages. The coal stages are much nearer to the signals, and the signalman can only let an engine into them by pulling the lever for that purpose.

The platform starting signals are three-position, Model 2-A dwarfs—0 deg. to 45 deg. lever control, and 45 deg. to 90 deg. semi-automatic non-stick, the third position being controlled through the track circuits and the outbound home signals at the Wye plant. The back up dwarfs and carriage siding starters are of the two-position, Model 3, solenoid type. The dwarf signal spectacles are enameled steel round disks about 22 in. in diameter, with the arm indicated in red on a white background. These dwarfs are considered a great improvement over the small arm type. At the Wye the three-arm signal arrangement was carried out for all interlocked signals; but the normal, medium or calling on arms are fixed in all cases where they are not required.

The Model 4-A switch machines were used for all single switches and compounds as well as catch points. Hayes derails are used, except at the siding derails, some of which are catch points and others Hayes derails. These siding derails are operated mechanically from the detector bar connection on the switch machine at the switch through the medium of switch and lock movements. The standard fittings of the General Railway Signal Company were employed, the only change necessary being that occasioned by the 5-ft. 3-in. gage, which is standard in this state. As the switches are supported on cast iron chairs, raising the rail about 2 in. off the tie plates, this permitted the No. 1 or switch tie plate to be laid without set, while still keeping the cover of the machine below the top of the rail.

The rail section is 80-lb. and the ties of Jarrah. This timber is much harder than any with which American railway men are familiar, all holes for dog spikes as well as coach screws being drilled. The Australian practice is to use round iron spreader rods, but the American arrangement of flat rods and point lugs was adopted so as to simplify the fitting of insulations and switch adjustments.

CIRCUITS

The track circuits are of the single rail type; that is to say, no insulations were placed in the negative rail, as the negative rails were all bonded together, forming the negative return to the storage battery in the cabin. Both Weber and Continuous joints of the 4-bolt type were installed to enable a test to be made to determine what type of insulated joint should be adopted for future work. The American oak in the Weber joints eventually will be replaced by Jarrah timber, as it is believed longer life will be secured thereby.

The control circuits are patterned very closely after the specifications of the R. S. A. All running signals are detected through switch boxes on facing switches and all catch points and Hayes derails are equipped with point detection for dwarf signals. Route locking for all high signals at the yard and Wye plants is secured by the use of normal indication locks on the signal levers, the route being held until the front of the train has reached the last track circuit in the route. No detector bars were employed for protecting switches, the detector track circuits with lever locks being used in lieu thereof.

G. R. S. relays were used throughout, carbon to copper contacts for 110-volt signal circuits, and silver to carbon for all other circuits. Standard 4-ohm relays were used for the automatic signals and 11-ohm relays for the interlocking circuits. The line relays were 1,000 ohm except where the control voltage was 110, in which case 2,000 ohm external was added.

As the ravages of the white ant are severe in South Australia, Oregon pine, because of the ease with which it can be worked, was used for all trunking, first being thoroughly soaked in "Carbolineum Avenarious" wood preservative, a dipping trough being built for this purpose. Pointed Jarrah stakes, rough sawed, 3 in. by 4 in. by 3 ft., were used to support the trunking line. Two stakes side by side were employed where the line exceeded 7 in. in width.

The power for the plants is furnished from duplicate sets of 200-volt to 110-volt d. c. motor generators placed in the same power house as the vacuum car cleaning equipment, at a point about midway between the yard and Wye cabins. It is a matter of interest to know that the total energy required for the operation of switches and signals at the two plants probably would not be equal to half a dozen 16 c. p. lamps burning continuously.

The construction work was carried out by the contractors, R. W. Cameron & Co., with local labor under the direction of two skilled men brought out from America to direct the work. Considering the fact that the maintainers required educating in the art of power signaling, in addition to the instruction of enginemen and signalmen, the plants have been working with a most satisfactory smoothness, and all the advantages anticipated, and more, have been realized.

RAILWAY DEVELOPMENT ASSOCIATION

The proceedings of the first two days of the convention of the Railway Development Association, held in New York City, November 9, 10 and 11, were reported in the *Railway Age Gazette* last week, page 909. On the third day, Thursday, the convention sat only from 10 to 1 o'clock. The principal business was the discussion of three papers: "Markets and Rural Organization," by G. C. White, United States Department of Agriculture; "Opportunities in the Making," by W. P. Hartman (G. R. & I.), and Harbor Development (New York), by Thomas O. McGill.

Mr. Hartman was the first speaker. His activities have been mostly with the farmers. He makes it a point to attend to the wants of the men already on the ground, even if new-comers may thus be neglected. His road has five experimental farms, the largest of which is one of 80 acres at Howard City, Mich. This is a region of poor soil and the lessons taught to farmers are correspondingly valuable. On two of the company's farms operations are carried on jointly with local farmers. One of the company's enterprises in this connection is a picnic grove which has helped to make the road's propaganda popular. Committees in the towns get up local fairs and co-operate in the picnic business, furnishing, perhaps, free coffee and ice-cream. In discussing the question of promoting good markets, Mr. Hartman cited examples to justify the view, not only of himself, but of apparently all railroad industrial agents, that the main objective must be the improvement of the quality of products.

H. B. Fullerton (L. I.) in the discussion of this paper, again emphasized the importance of markets. The farmer has been instructed in the production of his wares, and has made improvements; and yet he has come short of the desired prosperity because of the difficulty of always finding satisfactory markets. The United States Agricultural Department has lately established a market bureau, in this matter taking action which, if it had followed the lessons taught by the experience of the Long Island road, it would have done nine years ago.

Another member called attention to the importance of promoting markets impartially for all farmers and shippers. It is easy sometimes to help the grower who produces the very finest products; but what is wanted is a market for every shipper who will conform to prescribed standards. In New York State there is now a state standard for apples, and any grower may pack his apples in accordance with this standard and get the corresponding advantage. Good results have already been made manifest.

G. E. Cassel (N. & W.) described the lecture train which has been run recently over his road, giving instruction to the farmers by lectures and also exhibiting blooded animals. Both state and federal lecturers went with this train. Mr. Cassel pointed out some of the insuperable difficulties in maintaining ideal conditions year after year. This present year southern farmers have suffered large losses on potatoes, from causes which no one has been able to control. The railroads cannot do everything; it should be a constant aim to get farmers into the habit of watching markets on their own account. The discussion was closed by a short exchange of experiences in dealing with unenterprising farmers. The railroad agent who goes into a farming community must expect to find some lethargy and some opposition; his best course, as a usual thing, is to pass by the opposers, and seek men who are receptive.

Mr. White's paper began with a careful description of the organization and activities of his office at Washington. One of the difficulties in starting was to secure competent men for field agents. Most of those who were employed were men with commercial experience. The department has encouraged local co-operative associations of shippers of farm products; has investigated city markets and their location as related to the railroads, and has made market surveys of a number of cities. The transportation section, of which Mr. White has immediate charge, has a valuable library which is made use of in answering a great

variety of questions from all over the country. He is preparing to issue a bulletin on preventable freight claims. Market information has been gathered and edited concerning strawberries, cantaloupes, tomatoes and peaches; and this information, prepared daily in the market season, has been freely given out by telegraph to all persons who were willing to pay the telegraph tolls. The bureau was of material benefit to the Southern Pacific in disposing of the fruit crop in the Imperial Valley, Southern California. These activities have had to do with perishable products; but there is need of a similar organization to disseminate information by mail regarding markets for farm products less perishable. To enable the government to estimate fruit and vegetable markets with satisfactory accuracy, it is necessary that the railroads be willing to inform it of all diversions of carload freight en route.

Mr. White had found that many traffic managers do not properly cultivate the acquaintance of farmers; and on many roads he thinks there ought to be a more numerous force of traffic men. The railroads have a large field for enterprise where they might help those farmers who raise a variety of products, but who cannot ship carload lots of any one product.

In the discussion of this paper, W. H. Olin (D. & R. G.), said that he had been indebted to Mr. White's bureau for telegraphic reports which were of assistance in finding markets for cantaloupes. Mr. Hartman spoke of the importance of securing competent managers or secretaries for local market associations, citing an example of such an association which failed, and by its failure discouraged the farmers, when the only trouble was that an incompetent man was put at the helm.

The point was brought out that the railroad man who acts as a market agent, seeking good markets for farmers, is useful, but that for every man of this sort a large railroad should have at least four men to act as field instructors. Cases were cited where peaches, sweet potatoes and other commodities had to be thrown away, not because there was not a market for good products, but because the quality of the goods or the method of packing had been unsatisfactory.

Mr. McGill's address was mainly a sketch of the activities of state and city officers during the past four or five years in their work of improving docks and other terminal facilities in and around New York City. He explained the serious obstacles which had been the cause of the very slow progress. In two years about 45 acres of new or improved dock space has been provided by the city. At present piers 1,000 ft. long are being built on the Hudson river, between Forty-fourth and Forty-sixth streets. These piers involved great expense and delicate engineering problems. Piers now under construction in South Brooklyn will provide important additional space. The New Haven Railroad is building eight new piers on the East river front. The Marginal Railway, being built in South Brooklyn, will save manufacturers important cartage costs. Intelligent foresight would have provided some of these facilities many years ago. If the city of New York could be as enterprising as are some of the railroads it could reduce the cost of living in the city six per cent.

THE ENGLISH RAILWAY MEN'S WAR BONUS.—The increased war bonus which was detailed in the *Railway Age Gazette* of November 12, will apply to the salaried as well as the wages staff who are receiving not more than £150 ($720) per annum, and who have previously been in receipt of war bonus. Thus railway clerks 18 years of age or upwards whose salary is at the rate of 30s. ($7.50) per week or more and who have been receiving 2s. (50 cents) per week war bonus, and those under 18 years of age whose pay is less than 30s. per week, and who have been receiving 3s. (75 cents) per week bonus, will now in each case receive 5s ($1.25) per week. Further, those employees of the railways under 18 years of age who have received war bonus at 1s. 6d. (36 cents) per week will in future receive 2s. 6d. (60 cents) per week. This liberal provision was put in effect on October 16.

THE FUEL DEPARTMENT—A CONSTRUCTIVE CRITICISM*

By L. G. PLANT

Fuel Engineer, Seaboard Air Line

Were it possible to obtain a composite picture of the fuel department as it does, or does not, exist on each railroad, to compare the "average" with the "potential" fuel department, the comparison would invite criticism from at least a dozen standpoints fundamental to the success of a department responsible for the efficient selection, distribution and use of locomotive fuel. This criticism may apply in no particular instance; it is the average situation that is concerned. The conspicuous results that have been obtained on a few roads indicate how much remains to be accomplished on American railroads as a whole before the fuel department can be regarded as an entire success.

The fuel department has failed to establish its position in the organization of the railroad; it has never been recognized as an essential and integral part, equal in importance to the transportation, engineering and mechanical departments. In the original structure of the railroad only those departments essential to actual operation were included. Efficiency in operation has not until recently been given the attention it has always received in private enterprises where ownership is more intimately identified with the operation of the business. A department responsible for the efficient selection, distribution and use of locomotive fuel is essential to efficiency in railroad operation. To appreciate its importance, one has only to review the expenditures for fuel on American railroads or to consider the cost of this item on his own road in comparison with other operating costs. The position and responsibilities of the fuel department should be as well defined as that of any other department. It should afford a legitimate and effective means for dealing with the fuel problem in co-operation with other departments, not an opportunity for some individual or faction to exploit fuel efficiency at the expense of these other departments.

The fuel department has never developed any well-defined form of organization. The organization of the average fuel department is haphazard, its responsibilities are vague and it may be misplaced in its affiliation with another department. The transportation, engineering and mechanical departments have each a generally accepted type of organization found to be the most practical and efficient; the same should apply to a fuel department. This department should be responsible for efficiency in the selection, distribution and use of locomotive fuel. It should include two elements: One experienced in the use of coal, the handling and drafting of locomotives; the other technical, familiar with available fuels, their preparation and relative efficiency. The first element should include only experienced enginemen whose personality assures them the co-operation of the men whose work they supervise; the latter offers an attractive field for the technical graduate in railroad work. The organization of a separate department to supervise the selection, distribution and use of fuel may be justified under some circumstances; otherwise this work should unquestionably be conducted under the direction of the mechanical department. It must be borne in mind that the mechanical department is at all times held responsible for the satisfactory performance as well as the maintenance of motive power. The fact that fuel is a transportation charge does not justify the transportation department in attempting to supervise details of a mechanical or technical nature.

The fuel department has not yet adopted standard methods for supervising the selection, inspection, distribution and use of locomotive fuel. Local conditions may require some variation in the form of organization, the character and extent of supervision, the inspection and distribution of fuel; but there is so little variation in the purpose of the fuel department, the men and materials with which it deals are so generally alike, that there is an excellent opportunity for the wider application of those methods that have been found most successful. Wherever

*A paper presented before the New England Railway Club, November 9, 1915.

fuel economy has been given considerable attention some strong points in connection with this work have usually been developed. The organization of the fuel department may be unusually well arranged, the supervision over fuel use may be very thorough or the inspection of coal may be particularly effective. A complete study of the work being done on each railroad and of the results obtained in reducing fuel consumption would be of the greatest value towards raising the general average of efficiency in the fuel department. It is interesting to know that the United States Bureau of Mines is contemplating a detailed investigation to determine what steps are being taken by each railroad in the country to improve fuel efficiency; but it would be unfortunate if the government should undertake this work before a single railroad association had completed a similar investigation and before the railroads can exhibit a more uniform standard of fuel efficiency.

The fuel department has not been successful in arousing any widespread interest in fuel economy. Fuel consumption is, in a sense, the pulse of the railroad. It not only responds to the manner in which the locomotive is handled, but it reflects the condition of the engine and, in a measure, the condition of the track. It is sensitive to delays at terminals and on the road, and is directly affected by train loading. Hence, the co-operation of practically all departments is essential to securing maximum fuel efficiency. A division fuel committee, developed along lines similar to the safety committee, has been suggested as an effective means for enlisting co-operation. Its membership on each division should include an engineman and fireman from both passenger and freight service, and a roundhouse foreman from each important terminal. The division superintendent, chief train despatcher, master mechanic, road foreman of engines and fuel supervisor, if any, should complete the personnel of the committee. Meetings may be held monthly, at which all matters pertaining to the economical use of fuel can be discussed. Besides arousing a more general interest in fuel efficiency, these discussions will develop surprising breadth and result in a fund of valuable suggestions.

Failure to provide supervision in proportion to that found in any other branch of railroad service is the most conspicuous defect in the average fuel department. The best ratio of supervision generally in effect is that of one travelling representative of the mechanical or fuel department to 50 engine crews. A well-managed shop usually provides a better ratio of supervision, although the potential saving in the shop is a fraction of the possible saving on the locomotive. Furthermore, this comparison does not reveal so great a discrepancy between the wages of the shopmen and their foreman as may be found between the enginemen and the road foremen, where in many instances the road foreman earns considerably less than many of the men whose work he supervises. There are certain well-established methods for the economical handling of locomotives that will not be described here; the necessity for adequate supervision to insure their enforcement, however, is emphasized. Supervision over fuel use at terminals is equally important, as the opportunity usually exists for making a greater saving at terminals than on the road, in proportion to the fuel used. Supervision over the condition of the motive power is incident to the foregoing. Locomotives must be properly maintained if economical results are to be expected; but in this there is much detail, neglect of which will not actually cripple an engine, so that constant supervision is essential. Supervision must, in fact, cover every activity in the operation of the railroad in which fuel is a factor.

Education in the economical use of fuel is a relatively neglected feature in the work of the fuel department. Instruction in the use of the air brake and many other details connected with railroad operation is considered necessary. The air brake instruction car has become an established institution; why not a fuel instruction car? The necessity for such a car is perhaps not so urgent, the results to be obtained are not so tangible, but the possibilities are just as great. Education does not necessarily imply an instruction car, but it can probably be conducted to the best advantage through this means. The success of an instruction car depends upon the personality of its management, and, to a certain extent, upon the calibre of the men it is intended to reach. Instruction should be arranged for both enginemen and firemen. Cars designed for this purpose are equipped with a simple apparatus for demonstrating the process of combustion and a screen where pictures may be effectively used to illustrate details in connection with the proper firing of locomotives. Motion pictures can be used to the greatest advantage and these should be taken to illustrate local conditions. The value of this car simply as an "advertisement" for fuel economy must not be overlooked.

The fuel department has not furnished any tangible incentive for exercising economy in the use of fuel. One of the earliest attempts at fuel economy was the money premium awarded enginemen for saving coal. This has been discarded because it was impossible to award premiums with accuracy and fairness and because it was objectionable to the enginemen as a whole. The individual fuel performance record, however, remains as the best possible incentive that can be offered, provided an accurate and effective record can be published currently. The average fuel record is a failure because it disregards the effect of conditions beyond the control of the enginemen. It includes his performance with light, as well as with full tonnage trains, and superheater engines are often compared on the same sheet with engines using saturated steam. If based on correct principles, a very satisfactory and effective record can be computed without facilities for weighing individual coal issues. A record of every engine movement must be kept, giving the name of the engineman, the coal consumed, the freight ton-miles or passenger car-miles, as the case may be, and the coal consumption per ton- or per car-mile. This record is based on daily reports received from each terminal and is posted daily in a book similar to the familiar car record. Where operating conditions are taken into account and the engineman's weekly or monthly average includes only records made with tonnage trains under normal conditions, the record will prove a very fair estimate of the engineman's relative standing. This work must not become simply a routine clerical matter; the records require individual attention and a good performance deserves personal recognition. The performance records should be bulletined propmtly after the close of each period. The bulletins can be effectively designed with two columns, one showing enginemen above the average in red type; the other, enginemen below the average in blue type. The various types of engines and classes of service may be grouped separately. Such a record can be maintained at a cost of less than one dollar per month for each engine in service and will prove a conspicuous success towards stimulating interest in fuel economy.

The average fuel department has not assumed the same responsibility for efficiency in the selection of fuel as for economy in its use. The selection of coal is more frequently a matter of price than the result of a thorough study of available fuels. The cheapest fuel may not represent an ultimate saving, while higher priced coal should not be considered without assured facilities for utilizing its potential value. The breadth of selection is, of course, considerably greater where purchase is not confined to mines located upon the line of road. The fuel department should make a thorough study of available fuels, including comparative tests between coals from each field. These tests may be conducted upon a single engine operating preferably in passenger service and the evaporation per pound of coal carefully determined as an index to the relative value of the fuels tested. Where, as in some instances, a 10 per cent variation in efficiency has been found between coals obtainable at the same price, the value of these tests is obvious. There are few sections of this country that do not afford some undeveloped opportunity for effecting a reduction in fuel costs through utilizing inferior grades of fuel. For instance, it has been shown in a test that Texas lignite could be burned more cheaply than other fuels available in the Southwest; this fuel is so well adapted to the requirements of the locomotive stoker that its use on large

stoker-equipped engines in that territory would doubtless result in an important economic saving. The adaptation of locomotives to cheaper fuels is consistent with other economies undertaken by the fuel department.

The fuel department has not shown the same discrimination in the purchase of coal as is exercised in the purchase of many other materials. Specifications for coal are not as easily framed nor as readily applied. Following its investigation of available fuels, the fuel department should frame specifications adjusted to the character of the coal obtainable. Where mine run coal is purchased, the best percentage of lump and the lowest percentage of ash that may be expected with careful preparation are the most important items in the specification. Where coal is prepared over screens or through washers, the preparation should be specified in detail. B.t.u. specifications cannot be applied to locomotive fuel; the expense of sampling and analyzing is alone prohibitive. The laboratory investigation of coal should precede rather than follow its purchase.

Where the fuel department has recognized the necessity for fuel inspection, it has seldom appreciated its possibilities. The fuel inspector is usually the only representative of the railroad who remains in touch with the mine operators. He is responsible for the careful preparation of the coal and can very materially assist the operator in maintaining good standards. Being familiar with both the preparation and use of fuel, he is in a position to recommend some improvement in the method of preparation or the trial of a cheaper grade of coal. He can materially assist the transportation department in the handling of equipment to and from the mines, especially when the mines are not located upon the line of road. The inspector should have authority to reject, without question, coal inferior to the specifications in any detail. He may, for instance, suggest facilities for cleaning the coal or a method that will increase the percentage of lump; he may recommend the use of a 4-in. in place of a 6-in. coal from a certain mine; or, he may advise the transportation department of an impending shutdown at the mines and otherwise make his services of value to that department. The inspection of coal should be constructive rather than purely critical; where possible, it should be assigned to men with some technical ability.

The fuel department has given comparatively little attention to the economical distribution of locomotive fuel. Distribution of fuel is a matter in which convenience and expediency are generally the controlling factors. Important questions relating to the effect of foreign freight, the necessity for storage and the actual cost of distributing coal upon the line of road, enter into the problem of economical distribution. The effect of foreign freight should be considered in connection with the purchase of coal. The necessity for storing coal depends upon fluctuations in its price and other current conditions affecting each railroad. The distribution of coal should be arranged and supervised by the fuel department. A careful estimate of the actual cost of moving company coal should be made in place of estimating this cost upon an arbitrary charge per ton-mile. The relative cost of coal at each chute, quality considered, should be determined and a schedule arranged requiring engines to take as large a portion of coal as possible at points in their district where the cost is lowest. Observance of this schedule will result in an indirect but substantial saving.

The charge that the fuel department has failed to take its part in developing the economy devices that have made the efficiency and capacity of the modern locomotive possible, is perhaps an unfair one. It is generally assumed that it is not within the scope of this department to attempt this phase of the fuel problem. From a broad standpoint, however, why should this be so; why is credit for the introduction of the superheater and the brick arch largely due the manufacturer? Apparently the fuel department has neither time nor money for perfecting new devices; in some instances it has not even the facilities for giving them a fair trial. It is an unfortunate commentary on the fuel department that manufacturers of important economy devices must keep traveling representatives on the railroads to insure their proper use and maintenance.

Reviewing the foregoing, the success of the fuel department depends upon the following factors:

Recognition.—The railroads must recognize the fuel department as essential. It should be considered a logical branch of the mechanical department with a definite responsibility for efficiency in the selection, distribution and use of locomotive fuel.

Organization.—The fuel department should comprise an organization associated with the mechanical department. It should have a direct representation upon the road which will supplement rather than duplicate the organization of traveling engineers for the mechanical department. It should include a technical staff to assist in the testing and selection of fuel, to conduct its inspection and to investigate devices and methods affecting fuel use. It should further include a small office organization for handling routine matters and computing individual fuel records.

Standardization.—Methods for obtaining maximum efficiency in the handling and use of fuel should be standardized. This should be the result of a thorough study of the best practices in effect on each railroad. If the railroads do not make this study and do not effect a more uniform standard of fuel efficiency, it is probable that the United States government will.

Co-operation.—The fuel department must enlist the co-operation of every other department. The personality of the department and the spirit in which it is conducted are very important factors. The division fuel committee should be as widely established as the safety committee.

Supervision.—The mechanical department should provide supervision over the operation of locomotives to the extent that the performance of every engine and engine crew may be personally observed within a period of 60 days. This supervision may be divided with the fuel department, affording the latter a direct representation in the form of fuel supervisors. While the fuel supervisors can concentrate upon details concerning fuel use, their work should otherwise supplement the regular duties of the traveling engineers. Their compensation should be such that it will not prove a limiting factor in their selection.

Education.—Adequate supervision implies a degree of education, but to this should be added education of a more thorough and systematic character. The organization of the department should include an instructor qualified through experience and personality to conduct an educational course designed to reach all concerned in the handling of locomotive fuel. Where possible an instruction car should be provided.

Enthusiasm.—Where individual efficiency is concerned enthusiasm is a vital factor. The competitive fuel record presents one of the best incentives for enthusiasm among the men, upon whom results ultimately depend.

Breadth.—The scope as well as the spirit of the fuel department must be broad. The selection of fuel should represent a balance between theoretical and practical considerations;—its inspection should be "constructive." The policy of the fuel department toward the invention and use of new devices must be progressive—it should play a leading role in the conservation of fuel.

DISCUSSION

H. C. Oviatt, assistant mechanical superintendent, New York, New Haven & Hartford, said that practically the same organization as that outlined in Mr. Plant's paper is employed on that road. Including the road foremen of engines, there is one supervisor to about every 40 enginemen. He did not believe it advisable to attempt to check up enginemen too closely without having some means of knowing the actual amount of coal placed on the tender.

R. D. Smith, superintendent of motive power and rolling stock, Boston & Albany, believed in personal contact and co-operation with enginemen and firemen in bringing about economy in fuel consumption. This was also emphasized by Henry Bartlett, chief mechanical engineer of the Boston & Maine, who also referred to the importance of keeping similar grades of coal at both ends of a run. Mr. Bradley, fuel supervisor of the

Boston & Maine, advocated a central bureau to deal with all departments concerning fuel. In referring to the use of performance sheets for checking up enginemen, he gave it as his belief that any performance sheet was a great deal better than none.

W. J. Cunningham, president's assistant, Boston & Maine, dwelt on the effect of guesses as to the amount of fuel placed on a tender and the varying conditions on the road on fuel consumption and fuel consumption records. H. C. Oviatt also stated that, while he has never been able to find a satisfactory method of using the individual record, he believes in such records if it is possible to work them out satisfactorily. In closing, Mr. Plant explained in more detail the system of records employed on the Seaboard Air Line, which was described in the *Railway Age Gazette*, April 3, 1914, page 788.

MISSOURI COMMISSION ALLOWS GENERAL ADVANCES IN RATES

The Missouri Public Service Commission, in a decision rendered on November 13, allowed the railroads a general advance in passenger fares and advances in freight rates, with a few exceptions, making an average advance, it is estimated, of five per cent, effective on January 1, 1916. The railroads had asked for an advance in passenger fares from two to three cents a mile. The commission authorizes a fare of 2½ cents a mile on one-way tickets, 2¼ cents a mile on round trip tickets and 2 cents a mile on mileage books of 500 or 1,000 miles. The freight rate advances in many cases are less than those asked by the railroads.

The commission finds from the testimony that a minimum passenger rate of two cents a mile does not give the carriers two cents a mile for each mile a passenger is hauled, because of the necessity of the carriers to constantly meet each other's short line rates. The commission also finds that the reduction in passenger rates from three cents a mile to two cents a mile has not resulted in an increase in traffic. The minimum charge for carrying a passenger is reduced by the commission from 10 to 5 cents. It is provided that each full fare ticket shall carry with it the privilege of carrying 150 lb. of baggage and each half fare ticket 75 lb. The commission also orders that the rate for excess baggage shall be 15 per cent of the 2½-cent rate. As to joint line freight rates, the order provides that where a shipment moves from one line of road to another through mileage rates shall be applied as a maximum, with small arbitraries added to cover the additional service of switching and other incidentals. Grain rates are readjusted by provision for a lower rate on corn than applies on wheat, and a provision that the rate on grain shall include transit arrangements, terminal allowances and the usual absorption of switching charges. Increases are allowed on some livestock rates and decreases made on others. There is an advance on some classes of stone and a reduction in others. On the following commodities the application of the roads for increases was denied: Hard coal, soft coal, fuel oil, barytes, ore, ore products, mill logs, drain tiles, sewer pipes, canned goods, ice, hay, straw, broom corn, flour and feed.

The rates which are now advanced were reduced by the legislature, the freight rates in 1905 and in 1907, and the passenger rates in 1907. Temporary injunctions were secured from the federal court, and in 1913 the rates were put in effect after a decision by the United States Supreme court that the roads had not proved the rate laws confiscatory. The decision follows a long series of hearings at which elaborate statistical and other evidence was placed before the commission by the carriers.

The decision, which was written by Commissioners John Kennish and H. B. Shaw, and concurred in by the other commissioners, says that there is no doubt that the financial problems of the railroads operating in the state, as well as those in the entire country, have been made more acute by the European war; that the operating expenses of the roads have increased from year to year, due to increases in wages, increased cost of material and by other matters over which they have had no control, and that these conditions are not peculiar to Missouri, but apply generally throughout the United States. The decision comprises some 300 typewritten pages. Some extracts from the opinion are as follows:

"The carriers must be enabled to afford safe and adequate service to the public, meet their financial obligations and maintain dividends in such manner as to encourage further investments in railways and their stocks and bonds in this state, in order that such railroads may be able to perform the increasing duties demanded by the public.

"This state still needs many miles of new steam and interurban railroads to aid in its fuller development and the construction of such roads will require much new capital.

"We have carefully examined and considered all the evidence; we have also investigated the passenger rates of other states for comparative purposes, taking into consideration the similarity and geographical conditions as well as the density of population and difficulties of operation, together with the increased cost of operation not offset by increased revenue.

"We believe that all classes of passenger fares should be made reasonable and just, so as to encourage passenger travel. The automobile and the jitney which have come in the last few years and since the passage of the 2-cent rate, have doubtless reduced the short local passenger earnings of the roads of this state. What will be the future reductions no one can tell.

"When it is considered that we are asked to fix one schedule of rates that will be reasonable for 14 railroads serving territory dissimilar in cost of construction, in destiny and character of traffic, some containing large commercial centers and forming valuable connections with other carriers, while others do not, it is apparent, however well informed the commission should be as to the value of the property upon which the carrier is entitled to earn a reasonable return, no adjustment of the rates could be expected in which equal results would follow as to the return received by each carrier.

"The rates fixed will doubtless prove more profitable to some of the carriers than to others, nor do we think a general schedule is open to criticism because of that fact.

"For a carrier should not be denied all benefit of the advantage that comes from favorable location and from the efficient and economical management of its property.

"The most we can hope to accomplish is that the schedule of rates which we shall adopt, considering all of the carriers and all of the intrastate traffic devoted thereto, will be just and reasonable and will yield a reasonable average return on the value of such property."

It was contended by the railroads that higher freight rates are more necessary in some parts of the state than in others, but the opinion says that the evidence offered fails to justify a recognition by the commission of the state into A and B territories for the application of the proposed higher rates.

ELECTRIC RAILWAY IN SWEDEN.—The electrification of the railway from Kiruna to Riksgransen, in the extreme north of Sweden, is now complete. It is the first line on which the Swedish State Railways have employed hydraulically generated energy for railway traction. The line is also noteworthy by reason of the fact that a large section of it is within the Arctic Circle, where 50 deg. of frost are often experienced in the winter. It was to deal with the transport of iron ore from the mines which are located at the southern end of the railway to the Norwegian frontier that the electrification was undertaken.

LONDON & SOUTH WESTERN RAILWAY ELECTRIFICATION.—The first portion of this company's newly electrified lines, from Waterloo station, in London, to Wimbledon (through East Putney), was opened for traffic on October 25; the second portion of the electrified system (Waterloo, Barnes, Richmond, Kingston, Wimbledon, Clapham Junction, Waterloo) was nearly ready for operation at that time.

The Efficiency of French Women as Railway Workers

There Are Now 25,000 Satisfactorily Filling Such Positions as Porters, Car Cleaners, Conductors or Agents

By Walter S. Hiatt

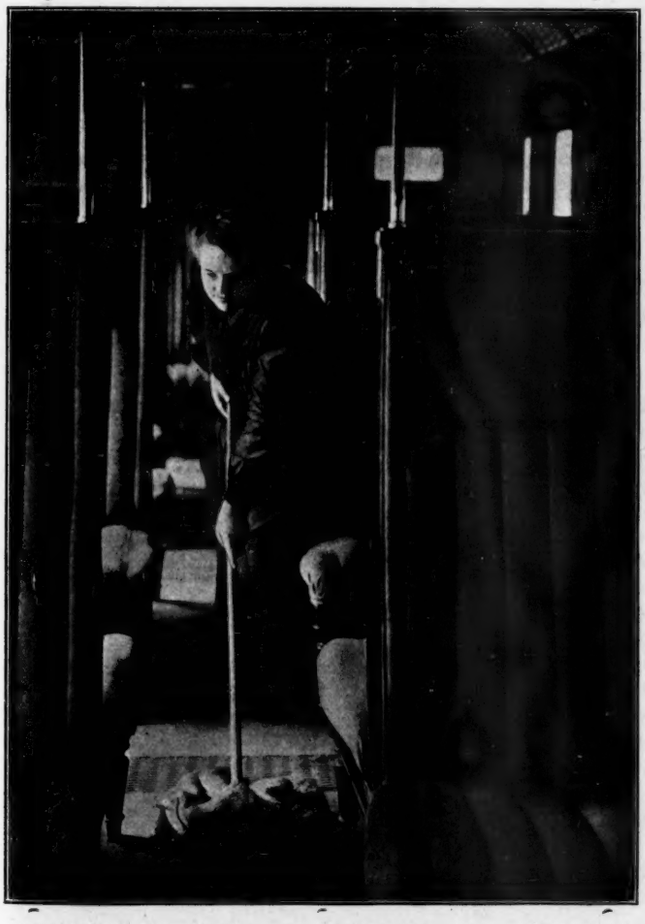
Our Special European Correspondent

The labor problem of Europe is slowly finding a solution.

The railroads of France, for instance, are to-day making one of the first absolute tests yet made on a large scale among civilized nations of woman's ability to fill man's place fully in one of the most hazardous of occupations. The test has already shown that in some respects woman is not merely the equal but the superior of man in his allotted field of manual labor.

The first street car I boarded on landing in France many months ago had a woman conductor and a woman motorman. Since then the employment of women has grown apace and one of the most important interior tasks of France, as is the case with other nations of Europe, has been the adaptation of women to places once regarded as belonging exclusively to men. It is, however, not a question of the invasion of men's places by women, or of the exploitation of female labor, but, rather, of getting the work of the country done at all.

The employment of large numbers of women on the railways has made woman's entry into the field of transportation more



Photograph by Georges Rodt

Cleaning a Second Class Car

than a curious or passing phase of the war. Her working on railways is a result of urgent necessity and has long since passed the experimental stage. The work of German prisoners has been limited to the handling of freight at ocean ports and is considered a makeshift. The native male population is busy in munitions factories or at the front, or else crippled beyond the capacity of manual labor. In view of the fact that the latter condition will have a lasting result and since there will be so many widows and other women forced to earn their own living henceforth, it is time to ask if woman is making good in her new occupation. There can be no doubt of it, and that answer has a meaning not only for Europe but for the United States,

Photograph by Georges Rodt

Women Cleaners at Work in Paris Yards of the P. L. M.

where we know women as stenographers, as clerks, telephone operators, but where, notwithstanding woman's invasion of industry, we do not know women as railroad telegraph operators, porters, ticket-sellers in railway stations, car conductors or car and locomotive cleaners.

Be it said in passing that Europe has for a long time been used to seeing woman as a manual laborer in the fields, as a fruit vendor, a janitor, a grocer, or as a railway grade crossing tender. It does not entertain any sense of pity, or of shame, if you will, in seeing her at a man's job. It watches her work from the standpoint of results. The laboring man once even watched her work with jealousy, feeling that her success meant lower wages and fewer places for him. Her work in the fields was such this year, however, that in France certainly it called forth the admiration and gratitude of the whole nation, for with less land to cultivate owing to the German invasion, she actually obtained a more abundant harvest than man had secured in past years. A Frenchman who had travelled throughout the country and seen the woman's wonderful work in the fields, jokingly said to me: "Would it not be a good thing to keep the men at war?" But for her active hands the munitions factories could not have been kept going at their high speed; but for her the entire post-office system of the country would have broken down under the double strain resulting from the enormous free military correspondence. Unspoiled by too much prosperity or by false

standards of social and economic equality, she works with a will and does her task well down to the last detail.

It is in the highly specialized work of the railroads, however, that the real test of her abilities has come. There are to date in France no less than 25,000 women occupying such positions as subway guards, conductors, station masters, porters, carpenters, clerks, platform cleaners, or cleaners of cars and locomotives, and each month sees this number increase as the men are taken out of the offices and put to work in the operating and shop departments. Months ago the telephone service was turned over to the women, and but recently the railway telegraph lines in the Paris station of the Paris-Lyon-Mediterranee railway began to be operated by women. In the south of France, on the Southern railway, women have replaced men as porters and freight handlers in large numbers.

On the State Railways alone, but one of the six great systems of France, more than 5,000 women are already employed, and they are on an equal footing with the men. While preference is given to the widows and daughters of employees, other women may enter the service after examination, and once in the service they become entitled to participation in the sick benefits and pension funds of the men. On this railway women are permitted to hold the position of station master (chef de halte) at village stops. Here, as on some of the other systems, uniformed women also travel as attendants or porters on the expresses and other through trains, their work being primarily to keep the first, second and third-class cars clean during the journey. On the Paris-Orleans system women hold positions as station agents at some of the important small cities, attending to all the duties of ticket selling, checking baggage and handling freight.

This expansion of woman's work on the French railways has been so rapid that the French public does not realize its extent, or has not paused to notice, so greatly has the war absorbed attention and upset old notions of fitness. For all that, the railway heads are closely studying woman's capabilities, as they must, in their splendid effort to keep their roads going smoothly. Every day the war lasts the railway officers must use a little more ingenuity to make ends meet, they must make old material wear a little longer, they must adapt old material to new uses, and one of their many heavy tasks is that of stretching the work of the decreasing amount of trained labor, putting women in places where men are not absolutely needed.

WOMEN CAR CLEANERS

Offhand, it is safe to say that women have not failed these railroad chiefs and particularly is this true of women engaged in lighter duties or in those places where courtesy counts. The most surprising test of woman's adaptability to a man's job I saw in the yards of the Gare de Lyon, the Paris terminal of the Paris-Lyon-Mediterranee railway. The chiefs of this railway have never hesitated to adopt any means, however novel, to accomplish a given end. When I visited its yards its officers had just come to the very definite conclusion that in many respects woman's labor was a factor worth considering even in normal times, and particularly in matters of railway cleanliness, where their work was far superior to that of men. I went to the yards where the women were at work amid the busy rush of moving trains. The foreman in charge of car and locomotive cleaning told me that in times of peace he had employed some 200 men on passenger cars, but that now he had but 105 men left. He had 80 women, the number of which he was gradually increasing, who had taken the place of the missing men. He explained that while these women were somewhat slower at cleaning the outsides of cars, which were washed with water and then dried with a squeegee, he found them not only quicker but neater with the inside work.

"Those women really clean cars," he said, and to prove his statement took me to some cars then in the hands of the women cleaners. The latter were not in uniform. Their hands and faces were quite clean and bore none of the traces of soot and grime familiar to the man cleaner. Those on the outside of the cars, armed with buckets of water and squeegees, were grooming them down, making the paint shine as if the cars belonged to the train of the President of the Republic. "Look how that brass work shines," continued the foreman. "Never have I been able to get men to polish it so. The only difficulty with the women is that they can't do the outside work very quickly, as it tires them to lift their arms."

The insides of the cars, whether first, second, or third class, were clean and neat as new pins. The windows shone like those of a London haberdasher. There was not a spot of grease or coal dust on the tan-brown cloth cushions. The lace curtains placed over the cushions to protect them from wear were newly laundered and looked as sweet as those of a parlor. The linoleum floors were as spotless as a Holland kitchen floor. I was surprised, because French trains used to be very dirty. Surely war has some compensations!

We walked through the cars where the women were busy with their soap and water, brushes and vacuum cleaners. The foreman tipped his cap in the pleasant French way, and the women smiled, proud of their work. I remarked that none of them were young.

"Oh, that's quite right," he answered. "The women we employ are all over thirty and we make a rule about their age. These women were chosen from 500. It won't do to employ young women. For one thing the older women are stronger and healthier; they know how to work and they know just how much they can do. Then, there isn't any foolishness about them, no joking with the men in the yards.

"There are only two objections I have found with women for railroad work. One is that they can't do much overhead work."

"And the other?" I asked.

"Would you believe it," said the foreman, "they're not afraid of trains. I can't get it into their heads that a train in motion is a dangerous thing to the most experienced railroad man. However, they are so cool in their ways that so far there have been no accidents."

"On the whole, then, they are quite efficient?" I asked.

"Indeed, there is no grumbling or back-talk from them ever. They do what they are told to the best of their ability. Besides, they neither drink nor steal."

WOMEN ENGINE CLEANERS

When I went across the Seine to find out how satisfactory the manual work of the women employed in the yards of the Paris terminal of the Orleans system had been, I heard the same story of woman's efficiency, though lively regret was expressed that the war had forced more women than ever into men's occupations.

In the yards of one railway the women had worked so well that a number of the stronger and more capable had been promoted to the cleaning of locomotives, which is surely a man's job. All engineers become careful to a fault about their engines and the French engineers are no exception. It was explained to me that since these women had been employed the engineers had been satisfied, for the first time perhaps since the war began. I watched the women at work. They were clambering over the engine, oiling it, rubbing it down, in a matter-of-fact manner, much as if they were scouring their kitchen floors, handling their oil cans and cotton waste with surprising ease. Here, too, they went about the job cheerfully.

"They've fallen in love with those engines, that's plain," laughed the foreman.

While there is no doubt now that after the war these women will be continued as car cleaners, it is yet a question as to how long they will be employed on the locomotives.

The same results obtained on these great railway lines have also been secured by the Metropolitan's subway lines in Paris. Its chief of personnel expressed himself to me as more than satisfied with their work. "There had been so many complaints about the untidy condition of the platforms," he explained, "that some months ago I replaced 75 men by as many women, and since then there has been an astonishing improvement.

Where the men left dust and papers in every corner, and failed to mop the concrete, leaving it sticky, slippery and alive with dirt, women have so cleaned the platforms that they look each day as clean as the day they were laid."

This officer further said that from a company point of view the work of all the other women employees had proven on the whole as satisfactory as that of the men who had been called away to do soldier duty. The company before the war employed 2,500 persons, 300 of which were women ticket-sellers. Since the war 515 men have been replaced by as many women, who act as conductors and guards and ticket punchers at the platform entrances. Most of these women are wives or relatives of the men mobilized as soldiers.

WOMEN EMPLOYEES MORE COURTEOUS

In an address before the New England Railway Club last January on "Making Friends," Roy V. Wright, managing editor of the *Railway Age Gazette*, said: "It behooves railway executives to bend every energy toward making friends with the public," and also, "ordinary acts are sure to cause friction unless courtesy is used as a lubricant."

Fine lessons in courtesy to the public are being given just now all over France by these women railway employees to an extent that is notable even in a country that prides itself on the politeness of all of its people, rich and poor.

Consider the women of the Paris Metropolitan. First, and despite their newness to their work, they are thoroughly efficient in answering questions regarding directions. Any subway, because of its winding underground passages and blinding lights, is confusing except to the habitual user. Paris just now is full of strangers, crippled and wounded French soldiers, soldiers on leave from the front, refugees and people who do not know their way about, and these women ticket-sellers and ticket-punchers show a surprising quickness in setting the stranger aright and doing so patiently and politely. This subway cuts under Paris in a dozen different directions; it has no less than 200 stations, no less than 50 transfer stations, and at that I have never seen a stranger fail to secure proper information or to secure this information promptly and courteously.

It must not be inferred that Paris is not crowded in war time, that it has not its rush hours like New York or Chicago, or that these women are not sometimes sorely tried in their duties. It is true that the Paris crowd of war-time is a quieter and more preoccupied crowd than the lively crowd of peace; universal suffering has tamed it, saddened it, and made it forbearing. For all this, there are periods during its rush hours when everyone is scrambling to get to or from work, or when crowds troop along at a Brooklyn-Bridge rate, and are impatient at delays.

For instance, the station at the Place de l'Opera is mobbed every evening towards six o'clock, and there a few months ago I noted the disputes that arose between the patrons and one of the men ticket-punchers whose duty it was to close a wicket to the platform before the train went on its way. This man, who was mobilized and therefore empowered to arrest turbulent passengers, was frequently nagged by people who arrived just as he was closing the wicket barring entrance to the platform. Later he was replaced by a woman, and either because of the subtle influence a woman exerts because she is a woman or because of her defensive smile as she barred the way in the course of her duty, those disputes have ceased. So much for the heart of Paris.

In the populous suburbs towards St. Denis and Pantin, where the very poor people live and work, the tramways are more commonly used. Disputes between men car conductors and men passengers were formerly rather frequent, but now they have materially decreased because of the magic smile of the woman conductors.

These women have but one fault—that is, if it is a fault. She is kind-hearted where soldiers are concerned. At car stops she cries out: "Soldiers enter first!" and frequently she forgets to collect their fares.

REPORT OF SPECIAL COMMITTEE

The Special Committee on Relations of Railway Operation to Legislation has issued its semi-annual report, showing that 235 railway companies operating 224,610 miles, are supporting the work of the committee. The report says in part: In response to Circular 70, May 3, 1915, the committee was authorized to apply to the Interstate Commerce Commission for an extension of time within which freight cars must be brought into conformity with the United States safety appliance standards. The application for an extension of two years from July 1, 1916, was made on July 6, 1915. A hearing was set by the Interstate Commerce Commission for September 28, 1915.

The data presented by the railways indicated that on July 1, 1916, there would be approximately 356,000 cars not equipped; that there had been expended to June 30, 1915, approximately $30,482,000; and that to complete the work would require an estimated expenditure of $13,860,000. It was also shown that cars in service prior to July 1, 1911, had been brought into conformity with the standards at the following rates:

Six months ending:	Number of Cars Equipped
December 31, 1911	36,720
June 30, 1912	86,777
December 31, 1912	133,203
June 30, 1913	154,149
December 31, 1913	167,165
June 30, 1914	154,430
December 31, 1914	173,223
June 30, 1915	182,332

The commission has not yet made any order on the subject.

In response to Circular 69, March 10, 1915, the committee was authorized to represent a large number of railways in the formulation of the rules and instructions for the inspection of locomotives and tenders required under the law passed March 4, 1915. A meeting of officers of the mechanical departments was called on May 25, in Chicago, and certain rules were formulated to serve as a basis for discussion before the matter was presented to the Interstate Commerce Commission; these rules were very generally filed by the railways.

It having become apparent that the passage of this act was to be used as a means to secure the installation of high-intensity headlights under all conditions of traffic, the committee called for certain information to enable it to meet the situation thus presented. In the meantime the chief inspector of locomotive boilers formulated a code of rules and sent it to the railways generally. A meeting was thereupon called at which these rules were carefully considered, and a series of conferences was held between the chief inspector of locomotive boilers and his assistants, the committee representing the railways and representatives of the employees. At this conference agreement was reached on all the rules submitted, except those relating to automatic bell ringers and high-intensity headlights. A hearing on the rules and instructions was called by the Interstate Commerce Commission for September 28 and 29, and after further conference with the chief inspector and the representatives of the employees on the preceding day, the matter was submitted to the commission for determination. The hearing continued until October 2, inclusive.

All parties agreed in asking the commission that all of the rules, with the exception of those relating to automatic bell ringers and high-intensity headlights, be made effective at such time as the commission might find it practicable to issue this order.

In view of the probable effort to secure legislation, specifying standard horizontal and vertical clearances, the sub-committee of engineering officers has been following the matter and will suggest a course of action in case the emergency presents itself.

The 43 legislatures which were in session during 1915 have all adjourned. In these there were introduced 1,097 bills affecting railway operation, of which 137 were enacted into law. This compares with similar figures for 1913 of 1,395 bills introduced and 230 laws enacted.

The character of the legislation enacted is indicative of a modification in the attitude of legislative bodies toward railway matters. This condition is due to a variety of causes, but there

can be little doubt but that the method of presentation on the part of the railways has contributed greatly to the result.

Beginning in 1911, the principle of handling matters pending before state legislatures through committees of operating officers, appointed by concerted action on the part of the railways interested, was inaugurated. In the two following years, this method of procedure was extended until nearly all of the states west of the Mississippi river, together with Ohio, Indiana and Michigan, had such committees, and during the year just passed the same form of organization was used.

The course pursued by these committees differed in the several states as the conditions required, but it is the consensus of opinion of the chairmen of all these committees that despite the loss of time involved in attendance upon the legislature, the handling of matters in this manner has been largely instrumental, not only in presenting the passage of much legislation urged by special interests, but in the establishment of more satisfactory relations between the members of the legislatures and the representatives of the railways, through the stranghtforward presentation of the facts and arguments in each case.

FUTURE METHODS

Whether the above method of carrying on the work in the several states will be sufficient to meet future needs is a problem. So long as bills are dealt with with practical finality in committees the presentation of the railways' arguments through individuals is effective, but a tendency is noted for committees to report out bills, not only with their approval, but in some cases with their disapproval, which has the effect of throwing the ultimate decision into the legislature itself. No argument is possible before the legislature, and in many instances a large proportion of its membership are uninformed as to the merits of a given proposition.

This is further complicated by the quite general practice on the part of various organizations of pledging individual legislators to certain courses of action in advance of their election.

To meet this situation, in some of the states extensive newspaper advertising was successfully utilized; in others, a large number of circulars of an informing character were issued to the public.

POSSIBLE RAILWAY SECURITIES LEGISLATION

By W. L. Stoddard

Washington, D. C., November 17.

According to an apparently authentic rumor in circulation here, the Interstate Commerce Commission will not, in its forthcoming annual report, renew its recommendation for the federal regulation of the issue of railroad securities. Those who are in a position to secure information on this subject declare, furthermore, that the President has determined to abandon the railroad securities bill, which was one of the chief items in the Democratic trust program.

It is probable that the commission's report will set forth its reasons for this change in policy, and such an explanation will be awaited with considerable interest. The Rayburn bill, which passed the house last year, was generally understood to be the commission's bill, and members of the commission, both at that time and since have publicly declared it to be their opinion that this legislation is of pressing necessity.

Of course, failure upon the part of the administration and the Interstate Commerce Commission to urge this measure at the present time would not mean that the measure in question could not be taken up independently and passed by both houses of Congress. If the advocates of federal regulation of railroad securities make known their will with sufficient emphasis, Congress is sure to respond to a certain degree. The case of the immigration bill is one in point—a measure finally vetoed by the President, but passed by Congress in spite of his lack of support, and, as a matter of interesting record, nearly passed by a Democratic house over the veto of a President of the same party.

Back of the railroad securities bill there lies a growing mass of favorable opinion. As far ago as 1885 the senate committee which framed the original interstate commerce act called attention to the evils arising from lack of regulation of railroad finance. It is interesting to recall that the late Senator Cullom of Illinois was chairman of that committee and may himself have written these words:

"This pernicious practice (fictitious capitalization, popularly known as stock watering), has unquestionably done more to create and keep alive a popular feeling of hostility against the railroads of the United States than any other one cause. It has imposed a serious and continuous illegitimate burden upon commerce. Excessive capitalization operates as a mortgage upon the industry of the country."

Apparently, however, not till the passage by the house of the Mann-Elkins Act of 1910 was federal security regulation advanced beyond the stage of denunciation and recommendation. That act amended the original interstate commerce act and gave the commission control over the issuance of railroad securities. The senate killed the section and substituted a provision for a commission to investigate the whole subject. Hence the Hadley Railroad Securities Commission, whose report declared that "accurate knowledge of the facts concerning the issue of securities and the expenditure of their profits is a matter of the utmost importance. It is the one thing on which the federal government can effectively insist today; it is the fundamental thing which must serve as a basis for whatever additional regulation may be desirable in the future."

In this historical connection it is also worth noting that the platforms of the big parties have declared for railroad security regulation. "We favor . . .," said the Democratic platform of 1912, "legislation preventing over-issue of stocks and bonds by interstate railroads, express companies, telegraph and telephone lines."

In both the house and senate there are many members of the party in power who will unquestionably make the point that the railroad securities bill has been before the country long enough to warrant Congress in enacting it without further delay. Some of the Democratic senators and representatives will undoubtedly argue that the party must redeem its platform pledge on this question, if it is to appeal successfully to the people to be returned to power in 1916. These arguments will be not without weight, and they may possibly be not without effect upon the situation.

It is rumored that the Interstate Commerce Commission, if it refers at all to the railroad security question, will suggest that doubtful points in the legislation hitherto presented to congress cannot be completely and satisfactorily settled until the valuation work is finally concluded—three or four years hence at the least. However, this is only a rumor and incapable of official confirmation at this time.

The overwhelming vote for the Rayburn bill in the house on June 5, 1914, may be an indication of its present strength with that institution. The yeas were 325, the nays 12; those answering "present" numbered 2, and 94 failed to vote.

The Railways of Greece.—There are about 950 miles of railway at present open to traffic in the so-called "Old Kingdom," *i. e.*, the territory occupied by Greece before the conclusion of the second Balkan war, while the new provinces possess a further 1,720 miles. An ambitious program of new lines has been drawn up, as the Turks have never constructed a single mile in Epirus or Crete, while in Macedonia they have contented themselves with such main arteries as were absolutely necessary. Two lines, with a length of 60 miles, are proposed in Crete, while Macedonia is to have five, with a total length of 320 miles. The most important of these, the Calambaka-Sarowitz line (100 miles), not only runs through a district hitherto absolutely devoid of modern transport facilities, but is of great strategical importance, as it will enable troops to be concentrated rapidly on the north-east frontiers.

AMERICAN RAILWAY ASSOCIATION

The fall session of the American Railway Association was held at the Blackstone hotel, Chicago, on Wednesday, November 17. There were present 250 members and associate members represented by 195 delegates. The executive committee reported a membership of 403, operating 278,950 miles. The executive committee reported that J. E. Fairbanks had been appointed general secretary and treasurer to fill the unexpired term of W. F. Allen, who died last week. H. J. Forster was appointed assistant treasurer.

The committee on transportation reported that it had completed its work on the revision of the standard code of train rules, block signals and interlocking rules, upon which it has been engaged since July, 1911. The codes as presented by the committee were approved by the association. The committee expressed the belief that the rules are adequate to fulfill all the exigencies of train operation.

The committee on maintenance reported that it would issue a circular of inquiry concerning rules governing the determination of physical and educational qualifications of employees to ascertain whether a necessity exists for a further amendment of these rules. The committee presented specifications for high carbon steel joint bars and specifications for heat-treated oil-qnenched steel joint bars, as recommended by the American Railway Engineering Association. These were approved. The committee also presented amendments to the specifications for carbon steel rails, which were approved.

The committee on the safe transportation of explosives and other dangerous articles called attention to the necessity for uniformity in connection with the carriage of dangerous articles by passengers in passenger cars. It also called attention to the large amounts of explosives and ammunition now being transported and to the fact that no explosion or fire has occurred in handling this material. Attention was also called to the necessity of active interest on the part of all operating officials in the enforcement of the regulations prescribed by the Interstate Commerce Commission covering the transportation of gasolene.

The committee on electrical working reported that it has had under consideration the question of third-rail working conductor clearances, and submitted diagrams covering the clearances for rolling equipment, which interchanges between different roads and clearances for work equipment which does not leave the individual road. From information obtained, the committee is of the opinion that it would be unwise to extend the design nearer to the rail than at present. Attention was called to the National Electrical Safety Code which is being prepared by the Bureau of Standards of the Department of Commerce, and on the recommendation of the committee it was authorized to represent the association at hearings on this subject.

The committee on relations between railroads reported that it has approved the applications of eight roads to join the per diem rules agreement and has rejected the applications of three roads. It has reported to the executive committee on the eligibility of five roads to become associate members of the association and has rejected the application of one road. It has recommended the restoration of one road to the per diem rules agreement and it has passed upon the withdrawal of one road. In view of the last report of the Interstate Commerce Commission in the industrial railways case the committee is now recommending for admission to the per diem rules agreement, on proper application and approval of railroads which are recognized by the Interstate Commerce Commission as common carriers.

With the report was submitted a report of the committee on packing, marking and handling of freight, which has been conducting its work in accordance with the resolution passed by the association at its last meeing, and has been securing the co-operation of the traffic, accounting and freight claim organizations and departments. Statistics were submitted showing a saving of over $3,500,000 in loss and damage payments for the first six months of the year 1915 on 99 roads, as compared with six months of 1914, indicating the increased interest taken in this important subject and that the efforts of the railroads are meeting with success. There was also submitted a report of the committee on weighing, stating that negotiations with the United States Bureau of Standards and with the traffic associations in regard to the free testing of railway master scales by the government scale testing equipment had been successful, and that a program has been submitted to the members of the American Railway Association under which the government will test free, annually, all railway master scales, and in addition, in the states where there are no railway master scales, one scale which will be agreed upon between the bureau and the association. In return the railways undertake to move the government testing equipment to the designated scales without charge. The committee also reported on per diem, car service, switching reclaims, storage, national track storage rules, collection of waybill revenue, business, mail claim papers and statistics. The executive committee has now authorized the resumption of a monthly car location report, and this is being received and tabulated for the use of the members of the association, beginning with November 1.

Additional amendments to the code of LCL rules and rules for loading carload shipments of flour were presented and approved. Recommendations for a number of changes in the per diem and car service rules were approved.

The following were elected members of the committee on the safe transportation of explosives and other dangerous articles: New York Central, Norfolk & Western and the Pennsylvania. The following were elected members of the committee on electrical working: Delaware, Lackawanna & Western, New York Central and New York, New Haven & Hartford. C. W. Galloway, general manager, Baltimore & Ohio, and W. B. Storey, vice-president, Atchison, Topeka & Santa Fe., were elected members of the committee on nomination. The next session of the association will be held in New York, May 17, 1916.

REPORT ON COLLISION AT ORIENT, OHIO

The Interstate Commerce Commission has issued a report, dated October 12, giving the conclusions of H. W. Belnap, chief of the division of safety, on the causes of the rear collision on the Baltimore & Ohio South Western at Orient, Ohio, August 12, about 3 a. m., when seven passengers were killed. The facts of this collision were reported in the *Railway Age Gazette* September 17, page 504; and the present report agrees substantially with the statement then made, but goes much more fully into detail. Special attention is called to the fact that the car in which the passengers were killed was of wooden construction, with open platforms. It was built in 1883.

It will be recalled that the freight train, which ran into the rear of the standing passenger train, had been following it for about 10 miles under a rule requiring it to be run under control; and that it had been flagged more than once, both trains being compelled to move at low speed because of the damaged condition of the track due to heavy rain. The engineman of the freight claimed that he was running under control approaching Orient, but that the heavy rain which was falling interfered with his vision and also prevented sand from becoming effective on the rails; but the event proved that he was not running under control. The grade was descending, about 26 ft. per mile, and there was a view of the standing train from about 750 ft. back. The passenger train stopped short of the station to take water.

The inspector holds the freight engineman mainly responsible for his disregard of the rule requiring him to run under control at all times after being passed by the passenger train until he should reach the next telegraph station [i. e., for about 20 miles]; but the conductor and flagman of the passenger train also are censured for not flagging, in strict accordance with rule 99, and also for not throwing off fusees.

The rule under which the freight was running is made specially for cases where a freight is passed by a passenger train at a non-telegraph siding; in that case it may follow the passenger after ten minutes, running under control. Mr. Belnap interprets this rule as being intended to provide for the movement of a train which had entered a block and for some reason was unable to clear the block for a following passenger train and was compelled to take a siding, to be passed, where no means of communication were available. In other words, it is a provision for unexpected emergencies. But in this case the side track where the freight had waited was less than a mile from the entrance to the block section, and there was a telephone by which the conductor could communicate with the block station. To have enforced the absolute block system the freight would have had to be kept 21 miles back of the passenger train. Prior to April 1, 1914, the block sections were much shorter than 21 miles, but on that date certain night offices were discontinued. If, says the report, it was safe and expedient to thus lengthen the block sections, it was the duty of the road to restore them, or at least to enforce the absolute block system, whenever the volume of traffic was increased, or a special passenger train was to be moved at night.

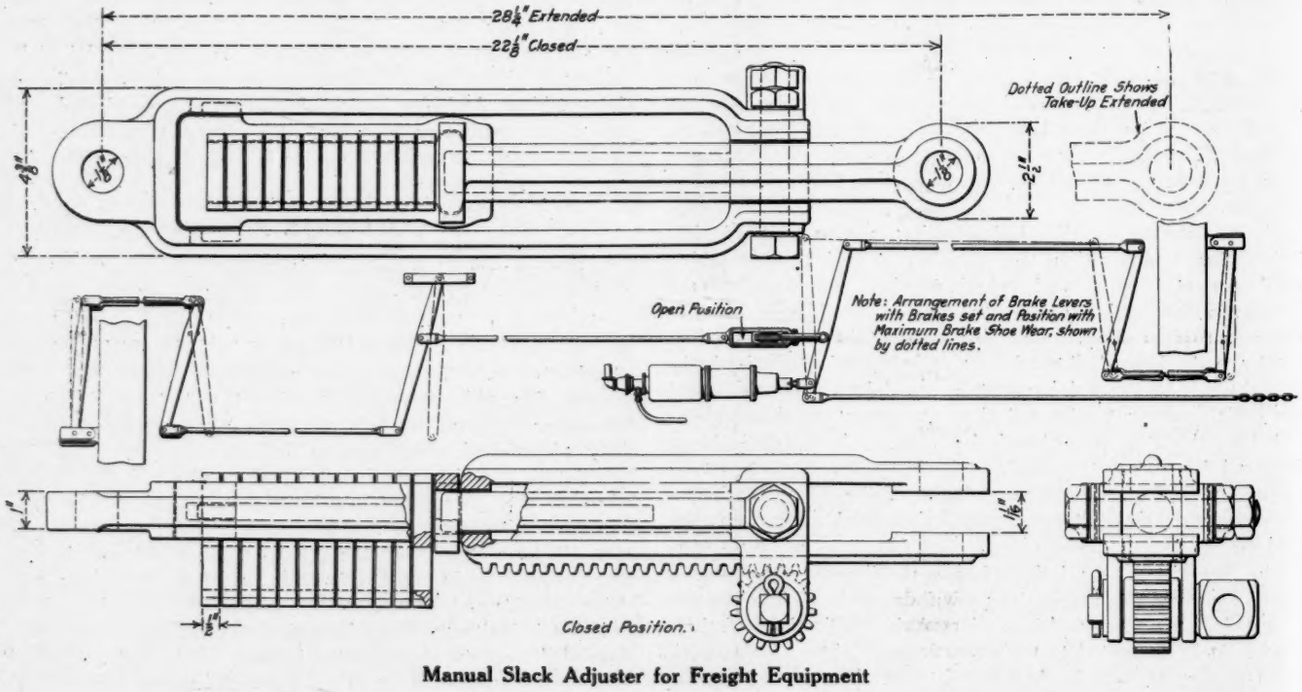
MANUAL SLACK ADJUSTER

A manually operated slack adjuster for use on freight equipment has recently been placed on the market by the H. W. Johns-Manville Company, New York. The purpose of the device is to make it unnecessary to crawl under each truck in order to take up slack due to brake shoe wear, a task both dangerous and difficult of performance. The device is located in the cylinder tie rod, where it is easily accessible, and but one adjustment is necessary for both trucks. The adjustment is made when the brakes are applied lightly so that correct piston travel may be obtained without trial adjustments.

The location of the device in the brake rigging as well as its construction are shown in the drawing. Adjustment is effected between the body of the device and a double yoke sliding within the body. The body is a malleable iron casting about 18 in. long of yoke form, the closed end being provided with a tongue which is connected to the end of the tie rod. The double yoke consists of two parts the sides of which are turned at right angles to each other. These two parts join at a throat through which is cored a hole 1⅛ in. in diameter. Lugs on the inner end of the double yoke fit into grooves in the side of the body, thus holding the end of the yoke in position and guiding the relative movement of the two parts. The jaw at the open end of the body is closed by a block of rectangular section on the end of a thrust rod, the upper and lower faces of this block serving as a guide for the open end of the double yoke. The thrust rod, which is about 9 in. long, extends back on the center line of the body and passes through the cored hole in the throat of the double yoke.

Within the closed part of the yoke are placed 12 thrust blocks, each one-half in. thick. The width of the opening between the sides of the yoke is increased at the throat to permit the passage of the retaining lugs on the ends of these blocks. A key block is inserted in this opening when the device is assembled and is locked by the thrust rod, which passes through a hole in the block. The thrust blocks have a length of 3 in. between the retaining lugs and through the lower end of each is a hole 1⅛ in. in diameter. When the blocks are raised until the lugs on the lower ends are brought in contact with the yoke these holes are in line with the thrust rod, thus permitting the yoke to be moved to the position shown by the broken lines in the drawing.

When slack is to be adjusted, the brakes are set lightly in order to show the piston travel. A pinion secured to the body meshes with a rack on one side of the yoke. By inserting a short bar in the capstan head of the pin which holds the pinion in place, the yoke may be moved back, thus shortening the length of the cylinder tie rod. As soon as the rod has been shortened one-half in. one of the thrust blocks will be released from the end of the thrust rod and will drop to its lower position by gravity. The other blocks follow successively for each succeeding one-half in. adjustment. In the lower position the solid portion of the block is opposed to the end of the thrust rod, thus preventing the return of the parts to the original position. The adjustment is continued till the piston travel has been reduced to standard. The total adjustment of 6 in. provided by the device is sufficient to take care of maximum brake shoe wear.


28¼" Extended
22⅛" Closed
Dotted Outline Shows Take-Up Extended
Open Position
Note: Arrangement of Brake Levers with Brakes set and Position with Maximum Brake Shoe Wear, shown by dotted lines.
Closed Position.

Manual Slack Adjuster for Freight Equipment

DRILLING TEMPERED STEEL.—To drill tempered steel or other hard material (even glass) use a drill tempered as hard as possible and camphor and turpentine, equal parts, in place of oil, on the drill.—*Power.*

Maintenance of Way Section

Preparing for the Winter

While any predictions regarding the weather to be expected this winter are very likely to prove widely inaccurate, the general expectation is that we are due to have a season of severity. The past year already has been one of hard trials for the maintenance of way department. Storms and washouts have been unusually frequent, while the rainfall has been considerably above normal in nearly all parts of the country. As a result, it has been difficult to maintain the track to its proper standards. At the same time, maintenance of way expenditures have been restricted so that it has been necessary to cope with these unfavorable conditions with less than the usual allowances of materials and men. Under normal conditions in the larger part of the country there now remains only a short time in which to get the track in proper condition for the winter. With the outlook before us, and the experiences of the past summer, the maintenance officer will only take reasonable precautions if he makes a special effort to get his track into the best possible shape in the short time remaining.

Using Second-Hand Ties

While the use of tie plates is now quite general, many ties are still being removed from track because of being badly rail cut rather than because of failure from decay. A desire to utilize the remaining life of the timber has led on some roads to the practice of turning the ties over and returning them to their original location in the main track. While from the standpoint of decay, such a tie is still good for considerable further service, there are serious objections to this practice, as pointed out elsewhere in this issue by W. E. Schott. A tie is not only required to transmit the vertical load from the rail to the ballast, but also to absorb lateral stresses. An old tie which has been turned over will show a materially decreased resistance to spreading rail and will be harder to hold to line, surface and gage. The cost of track maintenance will therefore increase. With the increasing cost of ties it is highly desirable to secure the maximum life from them. However, as the service required in high speed main lines is especially severe and as ties are also required for side and yard tracks subject to less exacting service conditions, it would seem advisable to use them there. Even under these conditions one must be careful that the cost of replacing a tie of this kind in a secondary track combined with the increased cost of maintenance does not exceed the value of the remaining life of the tie, just as in reclaiming scrap, constant care is necessary to prevent the cost of reclaiming material from exceeding its value after being reclaimed.

CHANGING THE FISCAL YEAR

ALMOST without exception, railway maintenance of way officers individually favor changing the fiscal year so that it will end on December 31 instead of June 30, as the most important single step which can be taken to increase the efficiency of this department. At the same time, no concerted movement to secure this change has been started by these officers through their associations, although this would be a natural course to take, as it is the maintenance of way department which is most directly affected by the present fiscal year.

There has been a general impression that the only serious opposition to this change would arise among accounting officers, who would have to adjust their records to correspond with the new year. For this reason the attitude of the railway accountants, as reflected by the action of the Association of American Railway Accounting Officers, is highly illuminating and encouraging. At its last convention, a committee reported the results of a canvass of members representing 200 railroads with an aggregate mileage of 271,857. Of these, members representing 130 roads operating 212,542 miles, or 78 per cent of the total mileage, favored making the suggested change, while those representing only 38 roads with 17 per cent of the total mileage opposed the change, and those from 32 roads with 5 per cent of the mileage did not vote.

The Association of Accounting Officers has not stopped with this vote, but is continuing the agitation, and at the recent convention of the National Association of Railway Commissioners at San Francisco, the president of the Association of American Railway Accounting Officers addressed the railway commissioners on this subject. While the co-operation of both the national and state commissions would be necessary to make such a change, there is reason to believe that this would not be difficult to secure if the railways were united in favoring the change. Now that the accounting officers have taken the lead in the movement for this improvement, it is to be hoped that the engineering and maintenance of way officers, individually and through their respective organizations, will give all possible help. No subject now before the American Railway Engineering Association or the Maintenance committee of the American Railway Association is more important. There has never been a time when it would seem that conditions were so ripe for making the proposed change.

PROPER RECORDS OF REINFORCED CONCRETE STRUCTURES

THE investigation of old steel structures for the purpose of determining their ability to carry increased loading is an important part of the work of the bridge engineer's office. Reinforced concrete structures are, as a rule, of such recent origin that the investigation of their ability to carry increased loading has not yet been called for, except perhaps in the case of culverts under deep embankments, which are to be widened or increased in height. However, it is only a question of time until train loads will have increased to such an extent as to raise the question of the carrying capacity of certain classes of the concrete structures we are building to-day.

The old plans of steel bridges, if on file, will play an important part in these investigations, but for purposes of checking the old plans and determining the state of preservation of the structure, frequent inspections are, of course, necessary, even to the extent of scaling and calipering the individual members. When the old plans are not available, detailed measurements are imperative.

The investigation of an old concrete structure presents a difficulty not arising in the case of a steel bridge. Once the former is completed, the record plan offers the only means of knowing the details of its construction. Subsequent inspection will give an idea of the quality of the concrete and perhaps disclose something of the state of preservation of any reinforcement it may contain, but it cannot disclose such details as the percentage of reinforcement, the number of stirrups or in the case of a culvert, even the thickness of the slabs. Superficial information, such as it would be possible to obtain by conversation with some one engaged in the construction work, would be valueless; for, just as we may find it necessary to order the heavy power off a steel bridge because of inadequate pin plates

or flange riveting, so the weak feature of a concrete girder may be the improper spacing of stirrups or inadequate bond lengths

In view of such facts, the need of a complete record of a concrete structure is obvious. Not only should the design plans be complete as to detail, but all alterations made by the construction forces should be made a matter of record. The field man is frequently inclined to express his contempt for the office man, and may even intimate that he changes the plans sent to him to suit himself, or that he builds according to his own ideas because the office plans have not arrived in time. Aside from the incorrectness of such a position from the standpoint of administration or the proper subdivision of duties, it is especially serious in connection with the preservation of adequate records. Without question, the field man must occasionally modify the plans sent him to suit unforeseen contingencies, particularly with respect to foundations. It should be an invariable rule, however, to make an accurate record of all such changes that are required. This applies no less to the maintenance officer, who has to make emergency repairs or extensions upon the structure already built, in accordance with old plans, standard plans or designs of his own. No matter what plan or method is used, he should do his part to see that an accurate record is made of the structure as he built it.

THE MAINTENANCE OF WAY ASSOCIATIONS

THE successful conventions of the Roadmasters' and Maintenance of Way Association, held in Chicago, September 7-10, and of the American Railway Bridge & Building Association, held in Detroit, on October 19-21, which were reported in the Maintenance of Way Sections for those months, bring to the attention of railway officers the work that these and the other maintenance of way associations are doing. The common purpose of all of these organizations is to develop and standardize methods and materials in their respective fields and thereby increase the economy of railway operation. For this reason they deserve the support and co-operation of the railways.

The position of the American Railway Engineering Association is recognized in the railway world and we refer here more particularly to the other associations in this field, the support of which is not so universal. At the present time some railways urge their men to attend the meetings of these organizations and pay their expenses. Other railways not only do not pay the expenses of their men but even discourage or prohibit them from attending. This is wrong. It is just as important and beneficial for the roadmaster or supervisor of bridges and buildings to be familiar with the latest developments in his line and to take advantage of the advanced methods brought out in his association as for the higher officer. One has only to compare methods on different roads to realize how rapidly materials and methods are changing.

There is a feeling in some quarters that the minor associations should be combined with the American Railway Engineering Association and that all the work should be done through it. If this plan were carried out it would mean the dissolution of the present associations without changing the American Railway Engineering Association to any appreciable extent, for this latter organization approaches the common problems from a standpoint different from that of the smaller associations and the members of these other associations would not feel free to take the floor in discussion with their superior officers.

There is, however, a field for the closer correlation of the work of the various associations, striving as they are towards the one common end of the improvement of railway maintenance of way. This should not take the form of dictation or censorship by the American Railway Engineering Association, but rather the work should be so divided that each association would confine its studies to its particular sphere of activity and the work of all the organizations would harmonize rather than overlap.

It has been seriously suggested that the reports of all railway association committees be submitted to the American Railway Association for approval before their presentation to their respective associations. This would not appear to be practical, both because of the delay which would necessarily ensue and because of the spirit of resentment which would be created by the exercise of censorship. The same results can be secured more satisfactorily by the roads stating their positions on various important matters to their more capable men and then urging them to attend and present these views at the conventions of different associations. It has been further suggested that a plan be worked out whereby the recommendations of the smaller maintenance of way associations may be passed on to the American Railway Engineering Association for its approval and incorporation in its Manual. In this way practices could be standardized and the results of the work of the smaller associations made available for all.

At the present time there are four associations in the maintenance of way field in addition to the American Railway Engineering Association, viz., the Bridge & Building Association, the Roadmasters' Association, the Maintenance of Way Master Painters' Association and the American Wood Preservers' Association, the last-named being composed only partially of railway men. If the work of these associations were properly organized and directed there would be no necessity for the organization of other associations, for if this is carried beyond a certain point it serves only to divide and weaken the activities of all. As at present organized, and in view of the work they are doing, the railways can well afford to lend their support to the existing associations by encouraging the men to participate in their activities. In this way only can the work of these associations be made of the most value to the roads.

NEW BOOKS

Field Engineering. By William H. Searles. Seventeenth edition, revised and enlarged by William H. Searles and Howard Chapin Ives, professor of railroad engineering, Worcester Polytechnic Institute. Size 4 in. by 6½ in., 632 pages, bound in flexible leather. Published by John Wiley & Sons, New York City. Price, $3.

This edition of one of the oldest and best known handbooks for railway engineers has been extensively revised to meet the changes which have taken place since the publication of the last previous edition, 11 years ago. It also contains over 100 pages more than the previous edition. The principal changes have been in the chapters on Maximum Economy of Grades and Curves, Reversed Curves, Spiral Curves, Earthwork Tables and Diagrams, Turnouts and Crossings and Calculation of Earthwork. The section on tables is also greatly enlarged, the principal addition being the earthwork tables and the data on spirals. Other new data in the book come under the heads of metric curves, velocity heads, grade angles, barometric heights, temperature coefficient, stadia reduction and mean refractions in declination.

The A B C of Iron and Steel. Edited by A. O. Backert. Size 8 in. by 11 in., 338 pages, bound in cloth. Published by The Penton Publishing Company, Cleveland, Ohio. Price, $5.

As indicated by the title, this book is a popular though comprehensive exposition of the iron and steel industry, intended for the layman or for the technical man in other lines who desires specific information somewhat remote from his own field. The separate chapters are by different authors. The treatment in each case is descriptive of the present practice and also historical. The 222 illustrations are of a high character and add much to the value of the book. There are five chapters on mining ores and transportation, two on the manufacture of coke, and other chapters on the manufacture of pig iron, wrought iron, crucible, Bessemer and open hearth steel, rolling mill practice, wire and wire rods, and three chapters on castings. The closing chapter describes the electric furnace and its use. Sixty-four pages are devoted to statistics and a manufacturers' directory.

Letters to the Editor

A GRADUATED WAGE SCALE

PROWERS, Colo.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

The ideas set forth in the letter from J. L. Coss in the *Railway Age Gazette* of July 16, in regard to the training of section laborers, are good as far as they go, but I believe the plan of working the men on a graduated wage basis is a better one. Thus, if a man goes to work the first of August, put him on at $1.35 per day. If he proves to be a good man after a few months pay him a higher scale of $1.60, and after he has worked a year put him on a maximum wage of $1.80 or $2 per day.

If the railways were to do this they would find that the work of their foremen would improve 100 per cent because the men would have something to work for and would give a better grade of work and more of it. As it is now a new man who never saw a railway before receives the same wages as a man who has worked for years. Under these circumstances a foreman cannot expect first-class work out of his older men, while a new man is inefficient because he does not know how to do the work. I believe a foreman can train his own men better than some one else can train them for him, as each man has a different way of doing things. If some one else trained the men it would make it very hard for the foreman as well as for the men.

R. E. PITTS
Section Foreman, Atchison, Topeka & Santa Fe.

TURNING TIES OVER

SAN FRANCISCO, Cal.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

Whenever track forces are engaged in raising track out of face this work is generally accompanied by a heavy renewal of track ties. Almost everywhere except on lines of late construction we find thousands of ties, especially cypress and redwood ties, which are still in a good condition, as far as the timber is concerned, but which are cut down under the rail base from ½ in. to 2 in. on account of having had no tie plates. In such cases most foremen, with the sanction of their roadmasters, are in the habit of turning those ties over.

There is no question but that by so doing any piece of track will look neater after the job is finished; but in place of improving the actual condition of such track distinct harm has been done. In the first place, the thickness of the timber under the rail is exactly the same. Even if the ties are turned end for end the cut part is still directly under rail and the actual increase of rail support is practically nil. The really bad effects of this tie turning though will appear from one to two months after the job is finished. About this time that piece of track will get rough and upon investigation it will be found that most of those turned ties are churning more or less, according to the quality of the ballast. The dirt or fine ballast will rise in mounds on both sides of those ties and most of them will be found swinging.

As every experienced trackman knows, the most difficult place to tamp a tie is directly under the rail. It is a procedure which is watched closely by every foreman when performing this kind of work. No doubt this was supervised closely when all those redwood and cypress ties were turned over, but, notwithstanding, it is almost impossible to get those cut places in the ties properly packed with dirt or ballast, especially when shovel tamped. Directly under the rail there was left a small space where there was no dirt, or, at the best, loose dirt, as this space could not be reached with tools, leaving an air space, and this same space, through compression by the weight of every passing engine and car, acting like an air cushion, has started to force all dirt from under the tie to the surface.

Retamping those ties is only a temporary relief of very short duration. The only remedy for this churning is to adze down to the depth of those cuts for about 8 or 10 in. from each side. It is a question, though, if this would be economical or if it would not be cheaper to prohibit this turning of ties altogether on main lines and use only new ties in all these cases, putting the cut ties only in side tracks or using them as fence posts or for other purposes, especially since they are inclined to break easily where cut out.

W. E. SCHOTT
Section Foreman, Southern Pacific.

ELEVATING CURVES IN YARDS

LOS TANOS, N. Mex.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

My experience in yard work has led me to discontinue elevating curves in a yard when there is slow traffic, as I have found that if such curves, regardless of their degree of curvature, are gaged to 4 ft. 8¼-in., or ¼-in. tight, one will experience less trouble in maintaining correct gage. The wheel produces less wear on the inner rail, prevents the rail from cutting into the tie and the track remains in surface and alinement longer. I have noted quite often that where turnouts were elevated back of the frogs they have been a constant source of trouble in maintaining gage, surface and alinement. I have also noted quite often on curves from ¼ to ½-in. wide gage in yards that the excessive pressure on the inner rail causes it to cant outward and the gage to widen very rapidly. It is understood that the gage of trucks is 4 ft. 8 in. from flange to flange, so why should it become necessary to leave curves wide gage even on the main line?

The writer put up one 5-deg. curve on main line, leaving the gage ¼-in. tight, and also a 4-deg. curve to standard gage. Both curves were equal as to timber, surface and alinement. The 4-deg. curve needed attention two years after it had been put up because the gage spread on account of the inner rail cutting into the ties. The ties then had to be adzed and the rail reset, gaged and given the proper elevation, while the 5-deg. curve remained in good condition for at least two years longer and held its uniform gage, surface and alinement.

A curve properly put up is easily maintained regardless of the degree of curvature. One will experience very little trouble in maintaining a curve of good timber, gage, surface and alinement. I have noted places where section foremen were unable to tell when a curve was uniform, and the spreading of the track seemed to be their trouble. They kept on gaging until the ties were spike killed, putting all the blame on big engines with long trailers. Upon examination I found the curves put up with improper elevation both on the body of the curve and on the easement. A car travels as a single body and the force of the car does not reach its full effect until the car is wholly upon the curve; therefore the approach and runoff on curves on high speed track should have the proper elevation and alinement or trouble will never end.

HENRY KOCH
Section Foreman, El Paso & Southwestern.

PENNSYLVANIA LINES ANNUAL TRACK INSPECTION

The annual track inspection of the Pennsylvania Lines west of Pittsburgh was made on October 5-8, inclusive, by the general manager and his staff, including the chief engineers maintenance of way and their assistants, the general and division superintendents, the division engineers, assistant division engineers and supervisors, traveling by special train. The inspection covered the main line of the Panhandle from Pittsburgh to Chicago and of the Fort Wayne from Chicago to Pittsburgh. The first prize for the best supervisor's subdivision based on line and surface was awarded to William Ballenger, supervisor, Indianapolis division, Bradford, Ohio. The prize for the best supervisor's subdivision based on all points was awarded to Henry Rice, supervisor, Indianapolis division, Urbana, Ohio. The prize for the best track foreman's section based on line and surface was awarded to Fred Manning, track foreman, also of the Indianapolis division.

The Proper Repair of Tools for Track Maintenance

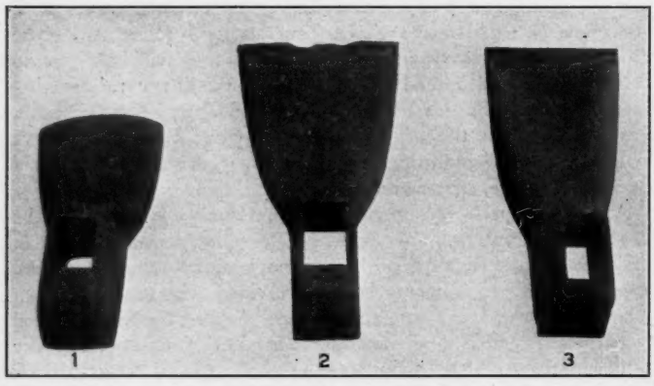
Work on This Equipment Should be Done in a Limited Number of Shops Under Adequate Administration

By M. E. Carroll

While many large and serious problems confront the master mechanic in his daily work, there is one which, while comparatively small in magnitude, is nevertheless always present and therefore aggravating. That is the problem of repairing track tools for the maintenance of way department.

In the average railroad shop, it is considered a small task to forge a locomotive main rod, to build a new tender or to perform any similar work for which the shop may be equipped. However, it seems a tremendous task to repair a few track chisels, dress a dozen tamping picks or put a track jack in good working order. This is not because these tasks are at all difficult, nor because the shop is not equipped for doing the work, or lacks mechanics sufficiently experienced to properly perform it, but rather because such work is a little out of the ordinary. If every locomotive had a few tamping picks as part of the equipment, or if every box car carried a rail drill, the shops would be accustomed to handling and repairing such items and consider it part of the regular daily routine. It is the unusual duty which we somehow associate as belonging to the other fellow and not belonging to us which is the hardest to perform.

Track tools are articles which must be used every day on each

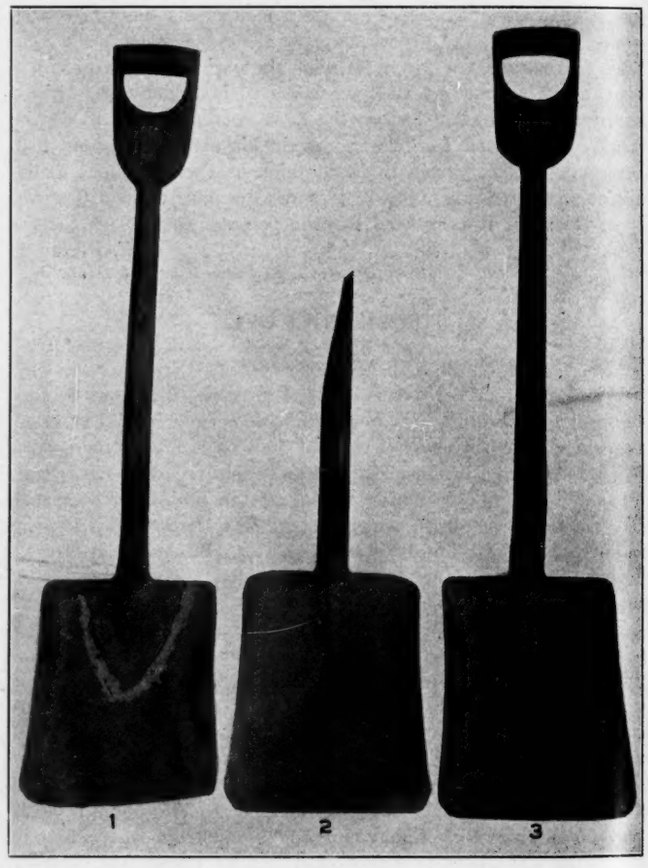


(1) Ground Down Until Worn Out. (2) Could be Put in Shape by Track Forces Without Being Sent to the Shop. (3) Has Been Reground Ready for Further Use

railroad system and in connection with such use, tools will wear out and sometimes become broken. The railroads do not earn money in sufficient quantities to permit them to throw away these worn or broken tools and they must therefore be sent to the shops for repair. It is the customary practice on most railroads to permit each foreman to bundle up a few spike mauls and chisels and a claw bar or two, sending them in a baggage car to the nearest division shops with a request to have them repaired and returned to him. It is not unusual for a section foreman to telegraph the master mechanic that his track drill or track jack is broken and is coming on "No. 21 today" with a request to have it repaired and returned "tomorrow morning."

There is scarcely a division railroad shop anywhere that is equipped properly to repair track tools because there is not enough of this work to occupy the full time of any mechanic. The very irregularity of delivery of the old tools to the shop is one of the reasons why the mechanics cannot be occupied regularly on work of this kind. When performed hurriedly and considered as an outside job to be rushed and disposed of in the easiest manner possible, it is small wonder that these repairs are sometimes improperly or indefferently made. The result is poor service and loss of time and money when the track forces attempt to use them.

The first remedy needed to improve the condition existing on most railroads is the concentration of this work at fewer shops. Where supply cars are operated, all worn and repairable track tools should be gathered up from each track gang and delivered at only one or two shops on the entire system. This will increase the number of each kind of tools to be repaired at that shop, making it possible to keep certain mechanics regularly occupied in doing this work. In consequence they will become expert and turn out repaired tools which will give service equivalent to new ones. The time of these mechanics can be charged direct to the proper operating account or to the division superintendent, and the master mechanic will therefore not need to feel that he is being robbed of time which rightfully belongs to his locomotives



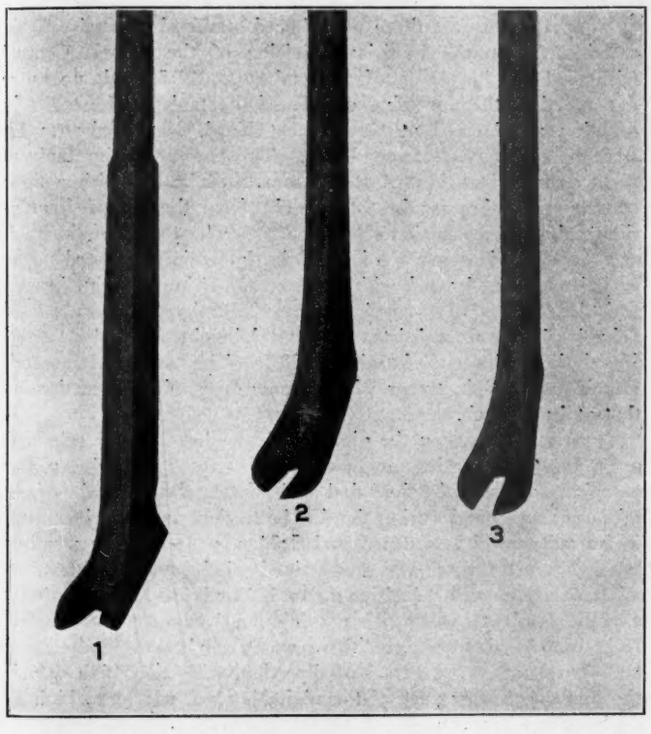
(1) Scrap Shovel with a Good Handle. (2) Scrap Shovel with a Good Blade. (3) A Serviceable Shovel Made by Piecing Together a Good Handle and a Good Blade Taken from Scrap Shovels

and cars. By concentrating tools in this manner, the smaller shops are relieved entirely of this kind of work and the division track forces escape the necessity of using indifferently repaired tools. When we have successfully concentrated this work at one or two shops and have perfected a system of gathering up all of the tools on the system regularly, making repairs and delivering them to the shops as suggested, it becomes an easy problem properly to organize the forces and equip the shop for handling the work.

The most difficult track tool to repair properly is the claw bar. Not one railroad blacksmith in twenty can take a badly worn claw bar and shape it so it will readily take and hold the head of a track spike imbedded in a hard wood tie, or temper it so that it will not break or the claws spread when in use. If, how-

ever, we can accumulate two or three hundred claw bars in one shop every month, we can keep one fire working on claw bars almost constantly and employ an expert for repairing them. Some claw bars will be received which are so badly worn that there is not enough steel left to dress them down properly, or perhaps one of the claws may be broken off entirely. Instead of consigning such a bar to the scrap pile, the claw should be cut off and the bar placed under a Bradley hammer and drawn down to make a standard lining bar. This operation will show a net saving of about 35 cents on each bar.

Where a fire is worked constantly to repair track picks with a small power hammer for making the welds, it is astonishing how cheaply these picks can be dressed down and re-tempered ready for use. Many picks will be received which are worn down so short as to make it impossible to re-dress them for



(1) Very Difficult to Repair, but Can Easily be Made into a Serviceable Lining Bar. (2) Can be Repaired Easily by a Competent Blacksmith. (3) An Example of Good Repairing

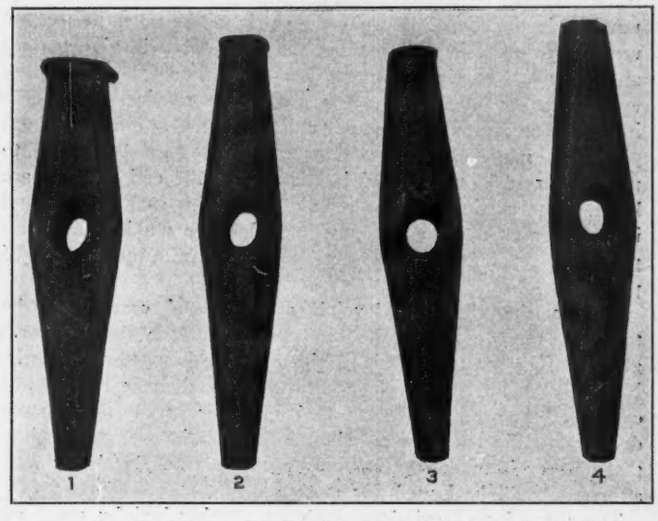
further use, and it is the customary practice to weld new steel and form new ends on them. The average railroad is not paying more than 35 cents each for new clay picks and 45 cents each for new tamping picks and if much welding is done on the old pick, it is going to cost more than a new one. It will be found the best practice to limit the welding of picks to the putting on of new points. If the tamping end of a pick is worn so it cannot be refaced to make a serviceable pick, the tamping end should be cut off and the end sharpened to make a clay pick. When both ends of a clay pick are worn down too short for repointing, the pick may well be scrapped. Some tool manufacturers make a practice of furnishing short tamping ends for picks, also the claw ends for claw bar, which can be welded onto the old pick and old bar, but unless shop costs are watched very closely, these welded tools will cost more than new ones.

When bent lining bars are sent in for repairs, in addition to straightening and re-dressing points, the bar should be tempered so it will not bend readily when re-issued for use.

The repairs of tamping bars should be handled much the same as tamping picks, the face of the bar being re-dressed when there is enough steel and if worn too short for re-dressing, the tamping end should be cut off and the remainder of the bar used for general purposes as bar steel.

Much care should be given to the dressing and tempering of spike mauls, this being a very important tool in track work, and personal injury accidents are likely to result if improperly repaired spike mauls are sent out for use. It is impossible to strike a true blow on a track spike or the head of a track chisel if the face of the maul is not finished true, and if tempered too hard, pieces are likely to chip off and fly. If, on the other hand, the spike maul is tempered too soft, it will give only a few days service and will then come back to the shop.

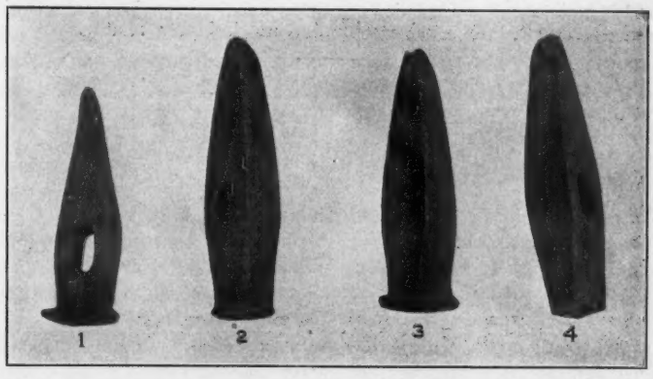
A tool which causes a great deal of trouble to a track gang



(1) Improperly Tempered When Repaired. (2) Should Have Been Ground by Track Forces Instead of Being Sent to the Shop. (3) Unserviceable Unless It is Repaired. (4) An Example of Good Repairing

is the track chisel. It is no uncommon thing to use six or eight chisels in cutting one rail, whereas one good track chisel properly handled should easily cut 15 or 20 rails. The first requisite of a track chisel is good steel, a matter for the attention of the Purchasing department, and in making repairs, it is equally necessary to shape and temper the cutting edge properly and to dress the head so that pieces will not chip off when struck by the hammer.

It is a serious mistake for track gangs to use track jacks which are not in perfect working order and equally wrong for shops to return jacks for use when not properly repaired. The rack bar of a track jack can be dressed up easily by a competent smith, making it equal to a new one, and the main or body casting



(1) Improperly Repaired Track Chisel. (2) Could Have Been Repaired by the Section Gang on a Grinding Wheel Instead of Sending It to the Shop. (3) Must be Repaired by a Blacksmith. (4) An Example of Good Repairing

if slightly bent or distorted, may be straightened in the fire if carefully handled. The remaining parts, if worn too badly to give the proper fit, can be replaced with new parts at such small expense that it usually does not pay to do much shop work on them.

The repair parts for track drills on the other hand are relatively

more expensive and quite a saving can be made if intelligent work is done by the man assigned to repair the drilling machines. A track drill is usually sent to the shop because it has been abused in service, rather than worn out, and a small amount of work will put such machine in first-class condition for further service.

There are two track tools which get out of order in service very easily and show defects which are difficult for the average track foreman to detect, namely, the track gage and the track level. The accuracy of these two tools is vital to the success of the track foreman in making and maintaining good track, and when repaired in the shops, the utmost care should be taken to see that repairs are made in such manner that the tools will give reasonable service. A rigid test for accuracy should be applied to every gage or level before it is issued for service. In repairing the Huntington track gage (this being the one made of gas pipe with malleable end castings), it is not good practice to plug and re-drill rivet holes in the pipe if the end castings are loose. The castings cannot remain tight with such repairs and it is better economy to use the old pipe for making pipe nipples and repair the track gage by applying a new piece of pipe.

In re-setting the spirit level in a track level, care should be taken to remove all of the old setting and see that the new glass is fully protected on all sides by fresh plaster of Paris. Not only should the level be carefully tested after repairs are completed, but the supply car clerk or other person making the delivery to the track forces should repeat this test at the time the delivery is made, so that only accurate track levels, as well as gages, shall be issued for use.

The use of tool grinders, such as are handled by most of the tool manufacturers at this time, should be encouraged among the track gangs, so that the grinding of edged tools and a certain amount of tool dressing may be done on the road, thus enabling the men to keep their tools in service a greater length of time before sending them to the shops.

The problem of repairing railroad track tools is a serious one with every maintenance of way officer, and with most master mechanics. It can never be satisfactorily handled unless the work is first systematized and made a definite part of the daily routine of some shop organization. To make this effective, tools must be gathered up regularly from the railroad as described, brought to some designated shop and there given thorough and effective repairs by a well organized and experienced shop force. Not only will these repairs be made at less cost than when made indiscriminately at all shop points, but tools will be repaired under this system which might be scrapped by the ordinary shop mechanic, and the repaired tools when returned to service will give much better results.

ABSTRACT OF ENGINEERING ARTICLES

The following articles of special interest to engineers and maintenance of way men, to which readers of this section may wish to refer, have appeared in the *Railway Age Gazette* since October 22, 1915:

Elimination of the Tower Grove Crossing, St. Louis.—The Missouri Pacific and the Frisco have recently completed the separation of grades at Tower Grove and Vandeventer avenues. The structures and the methods of construction were described in an illustrated article in the issue of October 29, page 799.

Completing the Summit Cut-Off of the Lackawanna.—This project was finished with the completion of the Tunkhannock viaduct, the largest concrete viaduct ever built, and was placed in service on November 7. The interesting details of the last work on this structure and others forming a part of the project were described in an illustrated article in the issue of October 29, page 809.

Completing the Mt. Royal Tunnel at Montreal.—This tunnel, which will provide an entrance for the Canadian Northern Railway into the heart of Montreal is nearing completion. Construction details of the more recent work on this project were described in an illustrated article in the issue of November 5, page 857.

Progress on the Hell Gate Bridge.—The closing members of the 1,000-ft. arch were placed on September 29; the details of this step in the work were described in a short article accompanied by a page of photographs in the issue of November 5, page 865.

The Cold Straightening of Rails.—J. T. Atwood, chief engineer, Pittsburgh & Lake Erie, discussed this question in a Letter to the Editor in the issue of November 12, page 888.

Gagging of Rails in Transverse Fissures.—A discussion of this subject in connection with the Cold Straightening of Rails in the form of a Letter to the Editor by A. W. Thompson, third vice-president, Baltimore & Ohio, was published in the issue of November 12, page 888.

Electrification of the Pennsylvania at Philadelphia.—The Pennsylvania Railroad has just recently completed the electrification of its line from Philadelphia to Paoli, a distance of 20 miles, for suburban service. The plant, equipment and construction involved in this project were described in detail in an illustrated article in the issue of November 12, page 889.

THE STABILITY OF UNANCHORED TANKS

By C. R. KNOWLES

General Foreman of Water Service, Illinois Central

The stability of unanchored railway water tanks has been the subject of more or less discussion from time to time, with advocates both for and against the practice of anchoring the tower of the tank to the foundation. Some authorities have claimed that the tower of tank should be firmly anchored to the foundation in all cases, while others have insisted that anchorage was unnecessary with railway water tanks 24 ft. to 30 ft. in diameter on standard 12-post towers 30 ft. high and under.

In view of this difference of opinion, it may be interesting to note the fact that three unanchored standard 20 ft. by 30 ft. wood tanks on the Louisiana division of the Illinois Central withstood the hurricane of September 29, 1915, with no more damage than the unroofing of one of the tanks. The tanks in question are located at Government Yard, New Orleans; La Branch, La., and Hammond, La. The tower of the tank at New Orleans is a 12-post steel tower, well braced with a floor system of "I" beams, the total height from the top of foundation to bottom of the tank being 20 ft. The tower of the tank at La Branch is constructed of 12 in. by 12 in. creosoted posts, each bent being braced with two sets of 6 in. by 8 in. braces, and the floor system consisting of 12 in. by 12 in. caps and 4 in. by 14 in. floor joists. The total height from the top of foundation to bottom of tank was 20 ft. The tank at Hammond, La., is on a 28-ft. tower of the same type of construction as that at La Branch.

The storm began on the night of September 28 with rain and a gradually increasing northeast wind. By 7 o'clock on the morning of the 29th, the wind had increased to a gale of 40 miles per hour, and during the day both wind and rain increased in intensity until between 5 and 5:30 p. m. when the weather bureau reported there was a sustained wind velocity of over 80 miles per hour and velocities up to 120 and 130 miles per hour for the hardest gusts, with a minimum barometer reading of 28.11 in. At about 6 p. m. there was a slight lull in the wind and shortly after a reversal of direction, with very high velocities for the greater part of the night, but not nearly so high as during the afternoon.

A large electric power station and concrete stack located directly across the street from the New Orleans tank were destroyed, and the Government Yard roundhouse, a frame structure about 200 ft. distant from the tank, was partly demolished. This tank was full of water throughout the duration of the storm and was not damaged in the least.

The La Branch tank is located 20 miles north of New Orleans in an exposed position near the shore of Lake Ponchartrain and among 12 or 15 houses, including the store and pumping plant of a drainage company. The tank and pump house are the only structures left standing. This tank was full of water when the storm began, but water connections to houses, which were destroyed during the storm, were broken, letting the water out of tank through openings aggregating perhaps a 2-in. stream. In addition to the wind at La Branch, the level of Lake Ponchartrain was raised about 12 ft., throwing about 7 ft. of water over the top of the rail and washing away both tracks. There was no damage done to this tank and but little to the pumping station.

The Hammond tank is 54 miles north of New Orleans and, while not directly in the path of the storm, it stood perhaps the most severe test of the three, as this tank was unroofed during the early part of the night of the 29th, and the valve to the tank spout pulled out, allowing the tank to empty through a 10-in. opening. Not more than 30 or 40 minutes were consumed in the water running out of the tank. As a result, the tank undoubtedly stood a great wind pressure while empty. This strain was especially severe on account of the height of the tower.

Railway Roadside Water Tanks for Locomotive Supply*

Important Details of Construction and Maintenance With Comparative Costs of Wood and Steel Structures

Up to within the past few years, the standard tanks rarely exceed 50,000 or 60,000 gal., while the standard roadside tanks on many lines today include tanks holding 100,000 to 150,000 gal. While the tendency of the railroads within the past few years has been to erect tanks of greater capacity, the development along this line has been all too slow and the efficiency of the water service is impaired in many cases to a great extent by small tanks. Particularly is this true at terminals, where a large number of engines take water in a limited time, and at roadside stations where it is necessary to employ night pumpers, thus materially increasing the cost of water. It is not economy to erect a tank good for a life of 30 or 40 years and then find within a few years that it is too small to supply the demand for water without continuous pumping.

The construction of large permanent tanks has been handicapped to some extent by the fact that, where tanks were located adjacent to tracks, the uncertainty of track changes and other construction features often prevented the selection of permanent locations. The result is that many of the tanks constructed are more or less temporary structures. By installing penstocks it is possible to select a permanent location that will not be affected by future construction changes. It is now the practice on many roads to erect the tanks remote from the tracks and deliver water through penstocks. In addition to permitting a more satisfactory location of a tank there are many other arguments in favor of this practice in preference to taking water direct from the tank.

The height of the tower or frame of the tank will be determined by the size of the outlet pipe. A 12-in. penstock with a 14-in. main will deliver 4,000 gal. per minute with approximately the same loss of head as a 10-in. penstock with a 12-in. main delivering 2,750 gal. per minute, or an 8-in. penstock with a 10-in. main delivering 1,750 gal. per minute.

The standard height of tank for locomotive supply is usually 20 ft. from top of rail to bottom of tank. With from 16 to 20 ft. of water in a tank, a 12-in. penstock with 1,000 ft. of 14 in. main will deliver from 3,500 to 4,000 gal. per minute, and for economic reasons, it would not be practical to exceed a height of 20 ft. to the bottom of the tank in ordinary practice.

SUB-STRUCTURE

There has been but little variation in the methods of constructing frames or towers for wood tanks, the common practice being to use a 12-post structure of 12-in. by 12-in. timber braced according to the height. Steel frames for wood tanks and in a great many instances for flat-bottomed steel tanks have also been of the 12-post type. The American Railway Engineering Association found in 1910, in answer to inquiries sent out, that of the roads reporting, 82 per cent of the 50,000 gal. tanks had 12 posts, 10 per cent 16 to 26 posts and 8 per cent 4 posts. Of the 75,000 gal. tanks reported 100 per cent had 12 posts with two exceptions, one with 21 posts and one with 16 posts. Of the 100,000 gal. tanks 100 per cent had 12-post frames with one exception of 4 posts. The general practice of constructing 12-post tank supports is explained in the fact that with a 12-post structure it is possible to secure a better distribution of the load than with a lesser number of posts, and to support every part of the tank bottom without an elaborate floor system. It also permits a good distribution of the foundation load. Treated timber will prove more economical than untreated for the construction of towers for flat-bottom tanks, notwithstanding its higher first cost, as treated timber will have a much longer life and does not require painting.

A treated timber tower is more economical than either a steel or an untreated wood tower for towers of standard height for locomotive supply. A steel tower will undoubtedly prove more economical and satisfactory for tanks on elevations greater than 20 ft.

WOOD TANKS

Most of the water tanks used for railway water service in the past have been constructed of wood, and while other materials are being used extensively for this purpose, there is no question but that timber will continue to enter into the construction of tanks of 100,000 gal. capacity, and under.

The life of timber in a water tank will vary widely with climatic conditions and with other factors which cause or prevent decay. The mechanical strain or wear a tank may be subjected to will also affect the life of the timber. Many tanks have been replaced, not so much because of the deterioration of the tank itself as of the decay of the structure supporting the tank, or more probably the decay of the floor and chime joists immediately supporting the tank bottom. All these factors have to be given consideration so far as the length of life and the general utility of various timbers and other material used in wood tanks are concerned.

The life of a wood water tank, no matter of what kind, depends largely upon the care in selecting and inspecting the timber entering into the construction. It is needless to say that the best selection and best quality of a cheaper timber will give a better and more lasting tank than a poor selection of high-priced timber. Few railroads properly specify a tank in their inquiries. They may give elaborate specifications for the hoopage, as well as for the dimensions of the tank itself, and may specify the kind of timber that shall be used, but they do not rigidly specify and inspect the quality and grade of timber to be furnished.

The average life of the various timbers entering into the construction of water tanks is about as follows:

Cypress	40 years
Redwood	30 "
Cedar	30 "
White pine	20 "
Douglas fir	16 "

To secure this life the most rigid specifications and inspection must be adhered to. Cypress is beyond question the best timber for the construction of water tanks. Next is the Pacific Coast redwood, which is an admirable tank material, but is little used in the central and eastern states. Eastern cedar, which is practically the only one of the cedars available for tanks, makes an excellent tank when the best grade is obtained. White pine is also a very good tank material, but is rarely available in suitable sizes and lengths for large tanks. Douglas fir is obtainable in almost any size and length, but is of comparatively short life.

A 20-ft. by 30-ft. water tank, consisting of staves and bottom planks, should be made of tank stock, heart red cypress, sound, seasoned, out of wind, free from shakes, sap, pitch pockets or streaks, unsound knots, loose knots, knots in clusters and large knots extending through the material. Small loose or unsound knots may be bored out and the holes thoroughly plugged with the same material as the tank. Material having knots in the edges should not be accepted.

Staves shall be 6 to 8 in. wide and 20 ft. long, of uniform width end to end, and 3 in. thick, with the edges accurately planed on radial lines from the center of the tub. The croze in each stave should be 3 in. in the clear from the end of the stave with a ⅝-in. gain and should be accurately cut to uniform dimensions on one circle for all staves. Three one-inch dowel pins made of the same material as the staves should be furnished with each stave, and the staves should be bored for dowel pins properly spaced. The bottom planks should be 12 in. wide and 3 in. thick.

* Abstract of a report presented at the convention of the American Railway Bridge and Building Association, held in Detroit, Oct. 19-21.

The bottom should be 30 ft. in diameter with a 3½ in. chamfer. All pieces should be full length without splicing, and every joint machine-made and perfect. The planks should be joined by one-inch dowel pins on 30-in. centers, of the same material as the bottom.

While the material in the tub is perhaps of the first importance, it does not embrace the entire structure. The frame, frost box and roof are constructed of entirely different timber than the tank proper. When these various features of tank construction are given consideration, it would not be fair to base the life of wood tanks altogether on the life of cypress or other timbers entering into the construction of the tub. Where the structure consists of a wood tank mounted on a steel or treated timber frame, the question of the life of the structure as a whole is further complicated. The life of the treated frame will depend on the treatment applied to the timber and may represent a longer or shorter life than the tank. As a means of fixing the approximate life of wood tanks on different types of frames the following tables are submitted:

The following table shows the life of various timbers suitable for the construction of tank frames:

Long leaf pine, untreated	10 years
Long leaf pine, treated with creosote	25 "
Long leaf pine, treated with zinc-chloride	15 "
Loblolly pine, untreated	3 "
Loblolly pine, treated with creosote	25 "
Loblolly pine, treated with zinc-chloride	15 "
White oak, untreated	15 "

The table below shows the life of hoops:

Flat steel hoops	3 to 5 years
Flat iron hoops	15 "
Oval steel hoops	6 "
Round steel hoops	10 "

When properly manufactured, a machine-made wood tank is better than one framed by hand. Of course, if the proper care is not taken with the machine, or if the machines are not properly set for each tank it is very likely that the framing or jointing will be poorly done.

The tank bottom should be carefully laid out, doweled and put together by hand. It is then scribed and cut to circle on a band saw, dressed and chamfered and the planks marked and numbered consecutively. The staves are then put on the tank and driven up, making the complete tank ready for the hoops. This enables the inspector to examine the tank carefully from the inside as well as the outside for possible defects in the lumber that may have escaped the timber inspector and the machine operators. There are virtually four inspections of the timber before it is shipped and the possibility of inadvertently overlooking a defective stave or bottom plank is remote.

While the tank is set up each stave should be marked consecutively, its position on the tank bottom also marked and a number corresponding with the number of the stave placed in the proper place on the tank bottom. This not only insures a perfect fit of the tank throughout, but simplifies and lessens the work of erection in the field.

The hoops comprise the most important feature in the maintenance of water tanks. With very few exceptions tank failures may be traced directly to the failure of the hoops. Flat hoops have been used almost universally up to the last few years, and as practically all of the older tanks are equipped with them, it is a popular belief that the flat hoop is more subject to failure than any other shape. This is probably true if the hoops are not constructed of the proper material and given the proper attention. So far as corrosion is concerned the flat hoop has a greater surface exposed than a hoop of different section; 40 per cent of this surface is next to the staves. Aside from presenting a greater surface to the corrosive elements this leaves 40 per cent of the hoop inaccessible to inspection. On the other hand it is easier to apply, forms a more uniform bearing against the stave, does not crush the fibre of the wood, conforms more readily to the circle of the tank, can be secured more readily for repairs than the odd shapes (with the exception of round hoops), will not break as easily as a hoop of different section, and lends in part at least to the life of the stave the loss due to corrosion.

Round hoops have come into general use only within the past few years, chiefly through the efforts of the insurance people. Round hoops are required on tanks used for sprinkler and other fire protection systems. The round hoop lends itself readily to inspection; any corrosion or deterioration may be easily seen and the whole surface of the hoop is painted more readily. One great objection to this type of hoop is the little bearing it has on the stave, which has a tendency to cut into the wood, crushing the fiber and inducing decay. This decay is further aggravated by the accumulation of dirt, cinders and moisture in the pocket formed by the upper half of the hoop.

Oval hoops or half round hoops have not come into general practice, while at the same time they have much to commend their use. They have the advantages both of the flat and half round hoop in that they give an even flat bearing to the stave and are heavier at the center like the round hoops, and they are not so quickly weakened by corrosion. The principal objection that could be offered to this type of hoop is that it is much harder to apply than either the flat or the round hoop on account of the difficulty in making it conform to the circle of the tank. The rigidity of this hoop is also objectionable in the fact that when the staves are softened by partial decay there is a tendency for the hoops to straighten out and throw the tank out of round, especially if the tank is empty or only partly filled with water. Various methods are used to fasten the lugs to the hoops, but it would appear that riveting is the most popular and economical method of applying them to the flat hoops. The method of applying lugs to other types of hoops will depend largely on the shape of the hoops. The single bolt is generally accepted as preferable to the double bolt for the reason that it is easier to apply it and there is a uniform pull on the lug and hoop. With the double bolts there is a danger of breaking the lug or shearing off the rivets unless great care is used to keep the bolts pulled up uniform in tightening the hoops.

Several factors enter into the life of a tank hoop, the most important being the material of which the hoop is constructed. The hoop should be constructed of wrought iron, but as few railroads pay much attention to this feature the hoops usually furnished are of steel. In fact there is a question as to whether wrought iron may be purchased in the open market in suitable sizes for tank hoops. The question of the quality of iron is of far more importance than the shape of the hoop. The seeming indifference of the many railroads to this feature compels the few who insist on wrought iron to pay a premium on the cost of hoops that even at the best do not come up to the standard that should be maintained.

Eliminating the question of adding to the appearance of the structure, the utility of a roof on a water tank is divided between frost prevention and protection from dirt. In the northern states there is no question as to the necessity of the roof on account of protection from frost, but it may be assumed that where the tank is not affected by frost, or the water is not used for drinking purposes, the only advantage in a roof is to add to the sightliness of the structure.

As a matter of frost prevention in cold climates there is no doubt but that water tanks should be well roofed. Decks constructed with double layers of dressed and matched boards with building paper between are of great value as a protection from frost. The objection to this type of roof and decks so constructed with the joists beneath them is that they are subject to rapid decay, on account of moisture and poor ventilation. Some roads are constructing the deck of two layers of 2-in. by 8-in. timbers spaced ¼ in. apart. It is claimed that this is as nearly frost proof as the double decking and it certainly is more substantial as far as decay is concerned. The roof should be conical of 1½ in. to 1 ft. pitch, with 14-in. eaves. The roofing material should be a good composition roofing, or good felt, with tar and gravel.

There are several points of primary consideration in the protection of water tanks and tank fixtures from frost. The protection required will be determined by climatic conditions and should be designed to afford protection against the most severe weather conditions likely to prevail. This condition can not be

based altogether on a minimum temperature, but upon the duration of low temperatures as well.

The source of water supply is another important feature. Where water is pumped from streams or ponds, the temperature is lower than where pumped from wells. As a result more insulation is required where surface water is used than with an underground supply. Where the pumping is continuous, or nearly so, and there is practically a constant flow of water to the tank, less protection is required than where the pumping is intermittent.

Where it is difficult to protect the supply line from frost properly, the pipe should be extended to the top of the tank and the line drained when not in use. The best type of frost box for supply pipes to wood tanks is one constructed of dressed and matched lumber, and lined with building paper with alternate 2-in. air spaces, the number of air spaces required varying with weather conditions. Five air spaces should be effective against a minimum temperature of 30 deg. below zero. It is important that the frost box extend into the ground well below the frost line to get the benefit of the radiation from the earth. That part of the box below the ground should be of concrete or brick. It is unnecessary to carry the air spaces below the ground, but the joint at the top of the foundation should be absolutely tight. The lumber used in the construction of a frost box should be thoroughly seasoned to prevent shrinkage, and the box should be made as nearly air tight as possible.

Some northern roads completely house in their smaller tanks, and heat them with stoves or steam. The usual type of construction is octagonal in shape, ceiled and lined with building paper between the walls. This leaves a dead air space between the inner and outer walls. The wall is carried about two feet above the top of the tank and the entire structure is housed in. The method is applicable only to the smaller tanks, is very expensive and is a bad fire risk. Where pumps are operated by steam it is sometimes practical to run the exhaust pipe through the frost box and tank. This is a safe and effective method of protection from frost, but is practical only where the tanks are in close proximity to the pumping stations.

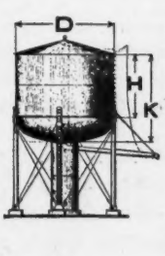
In extremely cold climates, the usual method is to house in the sub-structure of the tank and install stoves, extending the stove pipes up through the tank, the portion through the tank being standard wrought iron pipe. This method is effective, but offers a hazardous fire risk, as well as requiring a great deal of attention to keep up the fires.

It is often difficult, if not impossible, to keep the outlet pipe and valve from freezing without a stove or heater of some kind, but they should not be used if there is any other practical method to follow, as by using stoves under wood tanks the fire risk is increased ten-fold. The outlet valve should be kept in good condition, as leakage will cause ice to form in the outlet pipe. Locomotives on many roads are equipped with small sections of steam hose for thawing out outlet pipes and valves. Another effective method is to bring the end of the spout down over the stack of the locomotive and turn on the blower. This throws a hot blast against the outlet pipe and will thaw out a heavy accumulation of ice in a very short time. This should be used only as a last resort, as it plays havoc with the spout on account of the intense heat.

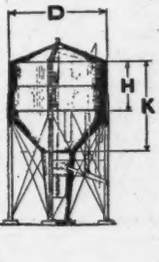
The winters vary in severity to such an extent in different parts of the country and the tanks constructed present such varied types that it is difficult to present methods of frost proofing applicable to all cases. However, the conclusion may be drawn that, with the modern type of wood tank construction delivering water to locomotives through penstocks, the riser pipes may be effectually protected by properly constructed frost boxes provided the consumption of water per 24 hr. is equal to the capacity of the tank. In the extreme north, where the winters are most severe and where the water consumption is small, a frost box would hardly prove adequate as the water in the tank itself may freeze solid. Under these conditions a heater of some kind must be provided to keep the ice from forming. In some cases the riser pipes of steel tanks are surrounded by wood frost boxes with air spaces as protection from frost. This is not good practice as it hastens the corrosion of the steel and does not permit proper inspection and painting. The best method of protecting a conical bottom steel tank from frost is by installing a stove or other heater in the riser pipe. The flat bottom steel tank may be protected in the same manner as the wood tank.

STEEL TANKS

The comparative life and value of wood and steel tanks has been the subject of much discussion, each type of tank having its more or less disinterested champions. While no doubt there are wood tanks in existence that will justify the strongest claims of the advocates of that type of tank, such cases can not be taken as examples of what can be expected of tanks constructed at the present time, for the reason that select tank timber is becoming more difficult to obtain year by year. Also the tanks cited as to long life of timber are smaller tanks than are being constructed today. Forty years ago a wood tank rarely if ever exceeded 20 ft. in diameter with 14 to 16 ft. staves, while many of the modern wood tanks are 30 ft. in diameter with 18 to 20 ft. staves. The mechanical wear on a larger tank is undoubtedly greater than on a small tank and deterioration is more rapid accordingly. On the other hand it would not be consistent to attempt to base the life of a modern steel tank on the life of an iron tank as constructed 30 or 40 years ago, as corrosion will necessarily be greater with the steel tank. There are



Capacity Thousand Gallons	Elliptical Bottom			Conical Bottom		
	D	H	K	D	H	K
15	15'-0"	9'-0"	12'- 9"	15'-0"	8'- 0"	13'- 7"
20	16'-0"	11'-0"	13'- 0"	16'-0"	9'- 9"	15'-11"
25	17'-6"	11'-0"	15'- 4"	17'-6"	9'-11"	16'-11"
30	18'-6"	12'-0"	16'- 7"	18'-6"	10'-10"	17'- 5"
35	19'-0"	13'-4"	18'- 1"	19'-0"	12'- 3"	19'- 1"
40	20'-0"	13'-9"	18'- 9"	20'-0"	12'- 6"	19'-11"
50	22'-0"	14'-0"	19'- 6"	22'-0"	12'- 7"	21'- 2"
60	24'-0"	14'-0"	20'- 0"	24'-0"	12'- 2"	21'-11"
65	25'-0"	13'-8"	19'-11"	24'-0"	13'- 8"	23'- 5"
70	25'-0"	15'-0"	21'- 3"	25'-0"	13'- 4"	23'- 8"
80	26'-0"	16'-0"	22'- 6"	26'-8"	14'- 3"	24'- 2"
100	28'-8"	16'-0"	23'- 2"	28'-8"	14'- 2"	25'- 7"
150	34'-0"	16'-6"	25'- 0"	33'-0"	15'- 9"	29'- 8"



Dimensions of Standard Steel Railway Water Tanks

no examples of steel railway water tanks that may be quoted to show the extreme life of steel tanks, as they were not in general use previous to 20 or 25 years ago.

In an attempt to arrive at some definite conclusion as to the comparative value of wood and steel tanks the following table has been prepared. The estimated life of each tank is given as 40 years, which would probably be the extreme life of either tank. The data regarding the wood tank is based on a clear heart red cypress with wrought iron hoops, creosoted pine frame and concrete foundation. The cost of the steel tank is based on a price for the tank complete erected on a foundation furnished by the railroad. The foundation in each case is figured on the basis of 60 yd. of concrete at a cost of $8 per yard. The freight rate is based on a haul of 400 miles on all material entering into the construction of the tanks except the sand and gravel used in the foundation, which is based on a haul of 50 miles. The insurance rate on the wood tank is based on 1 per cent per annum. The cost of painting the wood tank covers the wood tub, hoops, frost box and roof only, for the frame, being creosoted, does not require painting. The cost of painting the steel tank is based on two coats of paint inside and outside every four years. The cost of the steel tank is based on 5-16 in. steel throughout.

It will be noted that the capitalized cost to build and perpetuate a 100,000-gal. wood tank is $4,907.82, while the cost to build and perpetuate a steel tank of the same capacity is $4,111.24; this leaves a balance in favor of the steel tank of $396.59, and indicates that the steel tank is more economical than the wood tank. Perhaps the most important point in favor of a steel tank with a conical bottom over the wood tank is that a great deal of the suspended matter is precipitated in the mud drum. This mud drum may be cleaned very readily without taking the tank

out of service by simply opening the washout valve, while with the wood tank it is necessary to take the tank out of service at least once a year and more frequently where muddy water is used. The settling drum of the steel tank undoubtedly takes a great deal of the suspended matter from the water that can not be removed with a wood tank, and the advantage of removing this matter through the washout valve of the tank rather than from the locomotives in the roundhouse is apparent. It would appear that there is but little deterioration in a steel tank where the surface of the sheets is always covered with water and it is quite possible that it would be necessary to paint only the inside upper sheets, which are alternately exposed to the air and covered with water, every four years, it being necessary to paint the bottom and riser pipe only at longer intervals. This would reduce the cost of painting the steel tank from the figures given above.

C. R. Knowles (chairman), I. C.; A. A. Wolf, C. M. & St. P.; O. M. Suter, I. C.; T. J. Stuart, W. P.; Jas. Dupree, C. T. H. & S. E.; A. C. Sydell, C. B. & Q.; F. M. Case, C. & N. W., committee.

COMPARATIVE COST OF 100,000 GALLON WOOD AND STEEL WATER TANKS

DETAILED COST TO BUILD AND MAINTAIN A 20-FT. BY 30-FT. TANK ON WOOD FRAME.

	Material and Labor.	Freight.	Material, Labor and Freight.	Estimated Life in Years.	Percentage of Total Value.	Maintenance.	Cost to Build and Maintain.	Capitalized Cost.
Foundation	$480.00	$42.50	$522.50	Perm.	18.70	None	$522.50	.....
Substructure	600.00	44.32	644.32	25	23.00	$386.55	1,030.87	$268.40
Tank	1,050.00	14.53	1,064.53	40	38.00	None	1,064.53	176.24
Ladders	36.90	.95	37.85	10	1.35	113.55	151.40	60.17
Hoops	250.00	7.18	257.18	15	9.18	685.14	942.32	238.13
Frostbox	90.00	6.67	96.67	15	3.45	257.79	354.46	89.51
Roof	125.00	6.55	131.55	10	4.70	394.65	526.20	209.14
Painting	45.00	.40	45.40	4	1.62	408.60	454.00	210.67
Cleaning	20.00	.....	.....	1	.....	780.00	780.00	400.00
Insurance 1%	22.77	.....	.....	..	.....	911.40	911.40	455.50
			$2,800.00			$3,937.68	$6,737.68	$2,107.82

DETAILED COST TO BUILD AND MAINTAIN A 100,000-GALLON STEEL TANK.

Foundation	$480.00	$42.50	$522.50	Perm.	15.26	None	$522.50	.....
Tank	2,715.00	49.60	2,764.60	40	80.77	None	2,764.60	$ 457.71
Painting	135.00	.80	135.80	4	3.97	$1,222.20	$1,358.00	630.62
			$3,422.90			$1,222.20	$4,645.10	$1,088.33

ADJUSTING RAILROAD TRACK SCALES

For the sake of simplicity it will be assumed in this discussion that the track scale is provided with articulated loading girders, or, in other words, that the car-loading is applied to the several scale sections by means of a series of simple beams. As the reading of the weigh beam is the sum of the loads applied to it through the train of levers from the several sections, the errors in the multiplication of any or all of the sections are added algebraically to give what we may designate as the "observed error" on the weigh beam. If we could apply a load to only one section at a time in making a test, the error of that section alone would be apparent at once on the weigh beam, but this would be possible only if we could have a test car with a single pair of wheels. As soon as we have more than one pair of wheels, the load is distributed to two or more sections, and the errors of the several sections are recorded together. For this reason a two-truck test car would prove entirely impracticable and a four-wheel car should have a short wheel base, at least shorter than the distance between sections, as will be shown later.

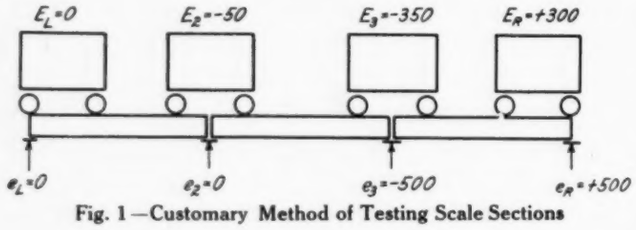


Fig. 1—Customary Method of Testing Scale Sections

In testing, the cars are commonly placed successively in the positions shown in Fig. 1, and it should be noted that in each intermediate position the car straddles the section so that part of the load is transmitted to the sections on either side. It is the practice to estimate from the observation, the nature of the real sectional error, the adjustment being made in accordance with this estimate. It is also possible to determine the errors mathematically. Let E_L, E_2, E_3 and E_R be the observed errors of the scale reading for the four positions of the car shown in the figure and let e_L e_2 and e_R represent the actual errors of the several sections for a concentrated load of 100,000 lb. Assume the distance between sections to be 12.5 ft. and the distance between the axles of the car as 5 ft. Then with a 100,000 lb. car in position over the left end of the scale the load carried by section L is 80,000 lb., and that carried by section 2 is 20,000 lb., and the reading of the scale is

$$100{,}000 + E_L = (80{,}000 + \frac{80{,}000}{100{,}000}\, e_L) + (20{,}000\, \frac{20{,}000}{100{,}000}\, e_2)$$ then

$E_L = 0.8\, e_L + 0.2\, e_2$ (where E_L, e_L and e_2 are negative or positive quantities). In the same way we find for Sec. 2 that

$$E_2 = 0.1\, e_L + 8\, e_2 + 0.1\, e_3$$

and $E_3 = 0.1\, e_2 + 0.8\, e_3 + 0.1\, e$

$$E_R = 0.2\, e_3 + 0.8\, e_R$$

Thus we have four equations and four unknowns e_L, e_2, e_3 and e_R, for which to solve simultaneously. Though the theory is simple the solution requires considerable tedious, painstaking effort.

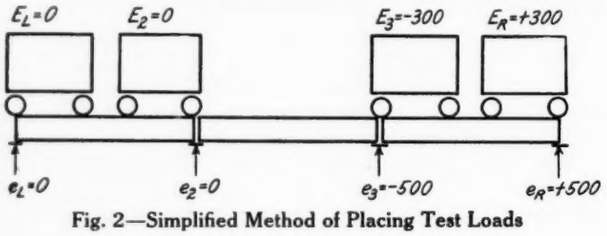


Fig. 2—Simplified Method of Placing Test Loads

This same condition is responsible for the difficulty experienced in making a trial adjustment by correcting for an estimated actual error, as the estimate will generally be far from correct because the error observed may be the sum of the errors on all three of the sections carrying the load.

It is possible, however, to use a system of placing the test load which will greatly simplify the mathematical solution and likewise make the trial adjustment a matter of definite steps, eliminating the guess work entirely. Assume the car placed successively in the positions shown in Fig. 2. Then according to the method given above we can write the equations,

$$E_L = 0.8\, e_L + 0.2\, e_3$$

$$E_2 = 0.2\, e_L + 0.8\, e_2$$

Here we have two equations with only two unknowns, e_L and e_3, and the solution is a simple matter. Two similar equations can be written for the determination of e_3 and e_R. It is also possible to solve the above equations to give the general form, $e_1 = (E_1 - E_3)\, N + E_2$, where N is a constant depending upon the dis-

tance between axles and the spacing of sections. Values of N for different values of these two variables are computed readily from which a diagram like that shown in Fig. 3 may be obtained.

It should be noted that the values of N are relatively large for long wheel base test cars. It follows then from the formula that

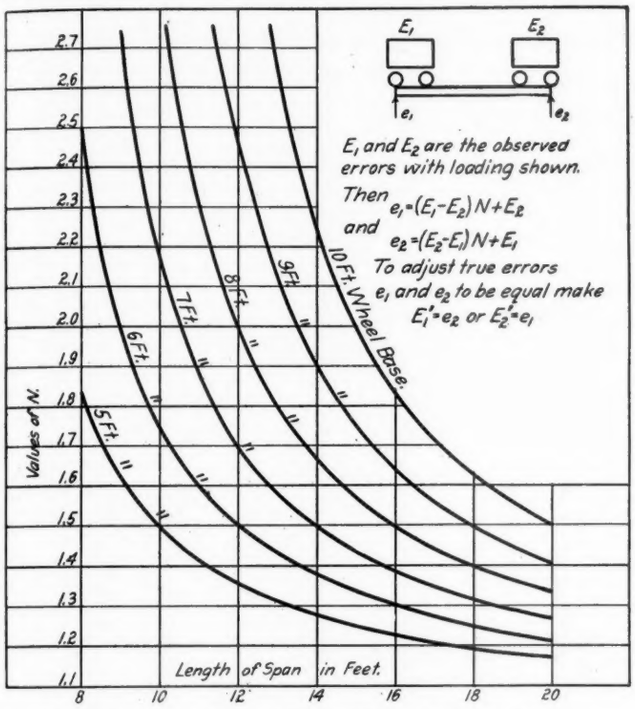


Fig. 3—Values of Constant-N, for Different Lengths of Spans

the longer the wheel base of the test car used the greater will be the difference between the errors of the sections and the observed values, and the use of a test car with a long wheel base makes the proposed method more necessary than if a short test car is used.

For the scale under consideration which has 12.5 ft. spans, we find the value of N for a 5-ft. wheel base test truck to be equal to 1.33. If we assume, for example, that $E_3 = -300$ lb. and $E = +300$ lb. and use this value in the formula we find that $e_3 = (-300 - +300)\ 1.33 + 300 = -500$ lb. If the leverage is then adjusted so that the observed error of section R is — 500 lb., the observed error of section 3 would be — 500 lb., and the actual errors of both sections would be — 500 lb. Both sections

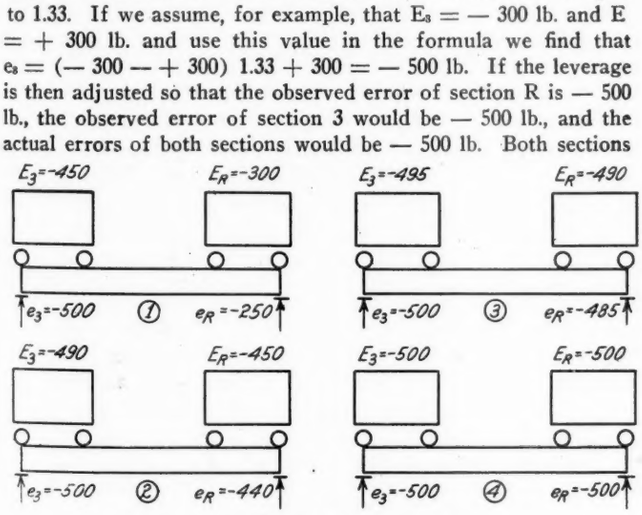


Fig. 4—Adjusting a Scale by Trial

are then corrected by moving the nose iron on the center extension lever.

Instead of using the foregoing method of finding the value to which section R is to be adjusted, the correct result may be obtained by trial. If E_R is made — 300 lb., E will be — 450 lb. (see Fig. 4.) Then E^R is made — 450 lb. and E_3 becomes — 490 and so on until E_R equals — 500 lb., and E_3 equals — 500 lb. The real errors of sections 3 and R are under these conditions both equal to — 500 lb., and when the right end is then quickened by 500 lb. the sectional errors disappear.

In the case of a five or six section scale, where it is desired to bring the errors of three sections to the same value, the method of procedure is as follows: The two sections nearest the fifth lever are first made to have the same real errors as previously outlined. The errors observed for the offset positions of the truck on the span between these two sections will then be equal to the real errors of the sections. The end section is then adjusted until the observed error for the position of the truck adjacent to the end section is equal to the real errors of the other two sections or the errors observed when these two sections are in a condition of adjustment.

Thus far the discussion has been applied to scales of the articulated type, but the method may be applied with advantage to scales having continuous girders, as can be shown from the re-

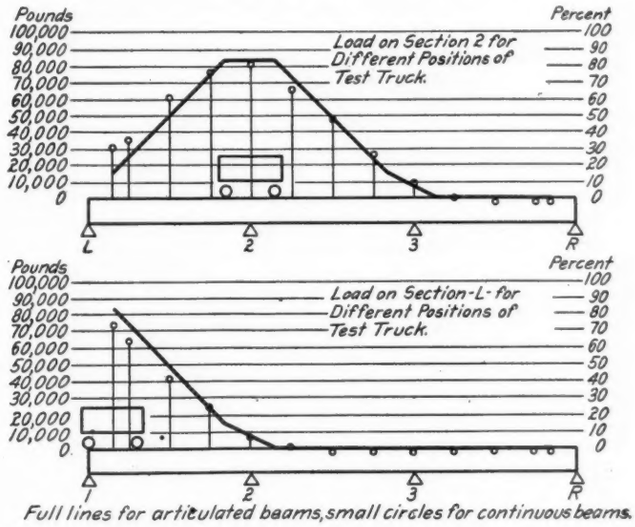
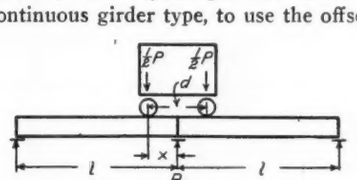

Pounds
Percent
Load on Section 2 for Different Positions of Test Truck.
L
2
3
R
Load on Section L for Different Positions of Test Truck.
Full lines for articulated beams, small circles for continuous beams.

Fig. 5—Distribution of Load for Different Positions of the Test Car

sults of tests made to compare the distribution on scales with continuous girders to that on scales with simple beams. This is shown in Fig. 5. Any ordinate to the heavy full line in the upper diagram represents the amount of the load carried by section 2, as calculated for simple beams, when the center of the car coincides with that ordinate. In other words, the line represents what is known as an influence line. In the same way the vertical distance to each of the small circles is the concentration on section 2, when the center of the car coincides with the ordinate through that circle, as determined by actual experiment on a continuous girder scale. The lower figure gives the same data relative to section L. It is to be noted that the agreement is close, but of particular importance is the fact with the continuous girder as well as with the simple beams, with both wheels in the space between two sections no load is transferred to any other section than the two between which the load is placed.

It is advisable then, when adjusting a track scale either of the articulated or continuous girder type, to use the offset method of



$R_1 = \frac{P}{2}\frac{(l-x)}{l} + \frac{P}{2}\frac{l-(d-x)}{l} = \frac{P(2l-d)}{2l} = \frac{P}{l}\left(l-\frac{d}{2}\right)$ Hence R is independent of value of x when x is less than d.

Fig. 6—Relation of Center Concentration to Position of Load

loading as explained. The use of a relatively long wheel base test truck makes this method even more necessary. The placing of one wheel over the section instead of straddling does not reduce the proportion of the load carried on the section, for as

shown in Fig. 6 the section concentration is constant as the truck passes over it.

The advantages of the off-section loading may then be summarized as follows:

(1) The load concentration on the section is the same as if the truck is centered over the section.

(2) The resulting observed errors are composed of the errors of only two sections.

(3) The nature of the sectional errors is easily determined from the observed errors.

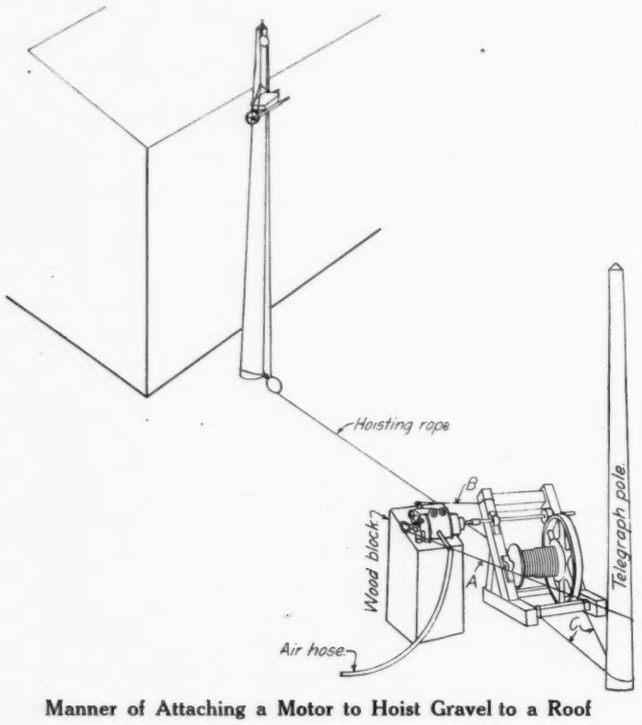
(4) Whether or not the formula is used the adjustment of the multiplication of track scales is simplified.

This article is taken in part from a paper presented before the last convention of the American Scale Men's Association, at Washington, D. C., by H. L. Van Keuren, of the United States Bureau of Standards, Washington, D. C.

USING A PNEUMATIC DRILL MOTOR AS A HOISTING ENGINE

By V. T. Kropidlowski
Chicago & North Western, Winona, Minn.

It is surprising to note the many uses to which an air motor may be adapted. Only a short time ago a bridge and building gang was engaged in renewing a gravel roof on a machine shop. Gravel was being hoisted to the roof by the wheelbarrow-full by three men working with a windlass. The idea occurred to someone to replace the three men at the windlass with a motor secured from the shops. As this motor requires but one man to operate it, the two men were relieved for other work, while



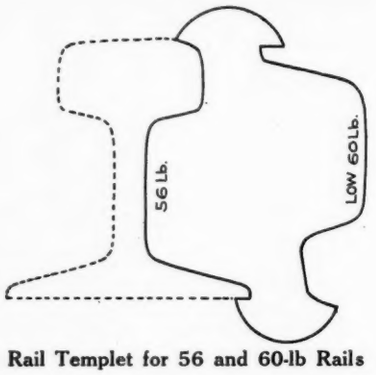
Manner of Attaching a Motor to Hoist Gravel to a Roof

three wheelbarrows of gravel were handled in this way to one by the men. The motor was attached as shown in the accompanying sketch. The windlass was anchored to a nearby telegraph pole by two ropes "C," as shown in the sketch. The motor was placed on a wooden block to bring it to a height so that its socket was on a level with the crank shaft of the windlass. The motor was then anchored to the block with a light chain, and to keep it from moving it was further held in place by wires "A" and "B." While it was necessary to fit a square socket to the crank shaft, this required very little work, as a Morse taper with a square socket was secured from the shop and this was made to fit by filing the square of the crank shaft slightly. At first a No. 2 Little Giant motor was tried, but this was found too small and a No. 0 motor was substituted. This latter motor was able to hoist a heaped wheelbarrow of gravel without any difficulty.

A RAIL TEMPLET FOR USE IN VALUATION INVENTORY

By F. V. Purcell
Assistant Engineer, Chicago & Eastern Illinois, Chicago

On most railroads the various weights of rail used in sidings and spur tracks vary by such small differences that it is difficult to distinguish the weight without spending considerable time and energy in measuring the individual rails, especially where the base of rail has become more or less imbedded in the ground. An added obstacle is the fact that the weight was usually not stamped on these old rails. However, each railroad has in the past adopted certain sections of the different weights of rail



Rail Templet for 56 and 60-lb Rails

for main track use, which in later years have been used on sidings and by making a templet of every section of rail which is known to have been used, it is possible to identify the rails very readily. These templets may be made of tin and if made like the one shown in the drawing, two sections of rail may be shown on each templet. This device has proven valuable to parties making inventories on valuation surveys.

INFLUENCE OF TEMPERATURE ON THE STRENGTH OF CONCRETE

Bulletin No. 81 of the Engineering Experiment Station of the University of Illinois contains a report by A. B. McDaniel of tests made to determine the variation in the strength of concrete cured at various temperatures. The test specimens were 6 by 6-in. cylinders, 6-in. cubes and 8-in. by 16-in. cylinders, the concrete being 1:2:4 and the storage temperatures varying from 95 deg. F. to 26 deg. F. Diagrams of compressive strength of the specimens at the ages of 3, 7, 10, 14 and 28 days, plotted against temperature show a surprisingly uniform increase of strength with higher temperatures. Tests on specimens subjected to a variation in temperature accord with the well known effect of freezing and thawing upon green concrete. As a limitation upon the practical application of the results of these tests in estimating the strength of actual concrete structures, it is well to call attention to the small size of the specimens. In large masses of concrete the conditions might be greatly different because of the effect of the heat generated by the chemical reaction of setting.

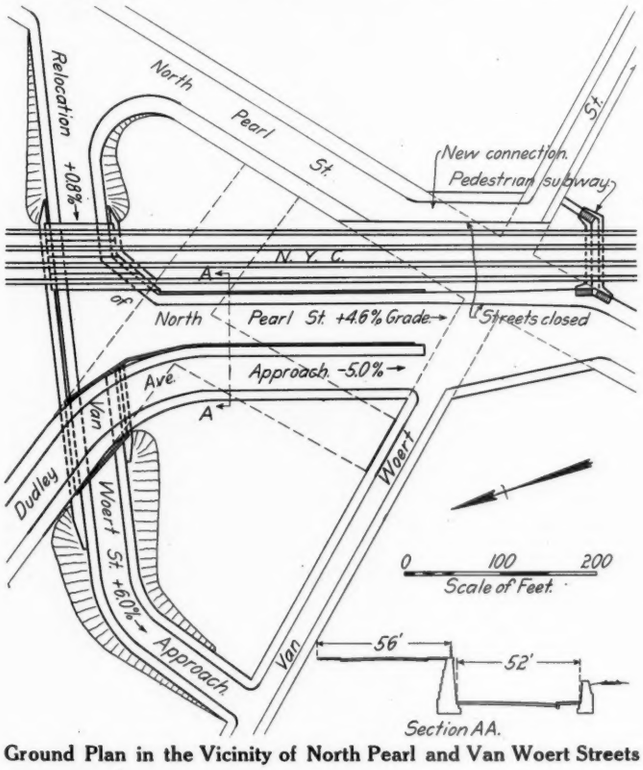
BRIDGE AND BUILDING CONVENTION AT NEW ORLEANS

At the closing session of the convention of the American Railway Bridge & Building Association, at Detroit, on October 21, it was decided to hold the next annual convention at New Orleans, La., on October 17-19, 1916.

Difficult Grade Crossing Elimination in Albany, N. Y.

A Description of the Measures Adopted at a Particularly Busy Intersection and of the Structures Erected

The New York Central has recently completed the solution of its grade crossing problem in the city of Albany, N. Y., by the elimination of the grade crossings at North Pearl and Van Woert streets. For an understanding of the importance of this work, and of the difficulties that have been overcome, it is necessary to point out certain prevailing conditions. The crossings are at a point on the railroad where railroad traffic is extremely heavy and congested. There are four main line tracks, consisting of two westerly tracks, numbered 1 and 2, for all local and through passenger trains, and a few fast freight trains; and two easterly tracks, numbered 3 and 4, for all freight, consisting of that leading to the interchange with the Boston & Albany, at Rensselaer, New York Central Hudson division freight, Albany local freight, besides light engines used to push the trains up the West Albany



Ground Plan in the Vicinity of North Pearl and Van Woert Streets

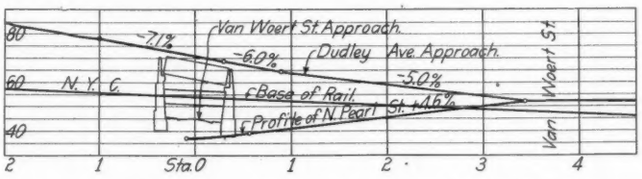
hill, which ascends westerly from the crossings. A record of train movements taken in November, 1911, showed an average of 155 movements for the 11 hours, from 7 a. m. to 6 p. m., or a train movement over the crossings about every four minutes.

The street traffic consists not only of that along North Pearl street, a main artery leading north from the city, but also that of Van Woert street, a much used thoroughfare leading from a residential section to the city's industries and river front. Observations made in November, 1911, showed an average number of vehicles and pedestrians during the corresponding period of 11 hours, of 1,626 on North Pearl street, and 1,586 on Van Woert street, or 3,212 over the crossing.

The original order of the Public Service Commission called for the elimination of these grade crossings within the lines of North Pearl and Van Woert streets by means of a subway. It was found, however, on account of the unreasonable prices claimed by the property owners for land and damages, that the cost of the elimination would be extremely high. After considering this, and the further fact that the amount of money the state had available with which to pay its share of the cost was limited, the case was reconsidered with the result that the final method of eliminating the crossings was determined upon.

In the new layout the location of both the tracks and streets are changed. The track changes consist in straightening the alignment by replacing a 4 deg. 30 min. reverse curve with a tangent formed by producing the tangent over the Broadway bridge. This affords more economic operation, especially since the tracks are on about a 1.5 per cent grade.

The street changes consist in detouring North Pearl street and carrying it under the tracks through a subway located about



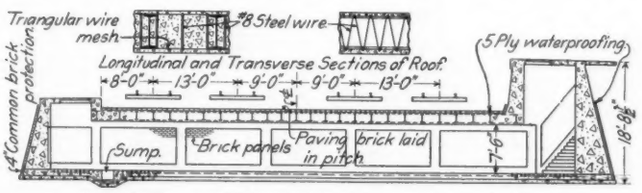
Profile of New Location of Dudley Avenue and North Pearl Streets and New York Central Tracks

400 ft. northerly of the existing grade crossing, in constructing a new street leading from the subway to Van Woert street on the west, and in extending Dudley avenue at a high level over the Van Woert street approach, to a plaza, where the new streets connect with the old. A portion of the space occupied by the old track alignment is utilized for the construction of a new street connecting North Pearl and Van Woert streets east of the tracks.

To reduce the damage to property, the low level North Pearl street approach and the high level Dudley avenue extension are placed directly adjacent to each other and the railroad tracks, being separated by mass type retaining walls supported on 40-ft. timber piles.

The bridges, one carrying the tracks over the North Pearl street, and the other carrying Dudley avenue over the Van Woert street approach, are both steel structures supported on solid concrete mass abutements having timber pile foundations. Both bridges have clear spans, it being deemed advisable to preserve unobstructed streets in order to permit of better views. The design of these bridges offers some interesting features.

The railroad bridge is a four-track through plate girder struc-



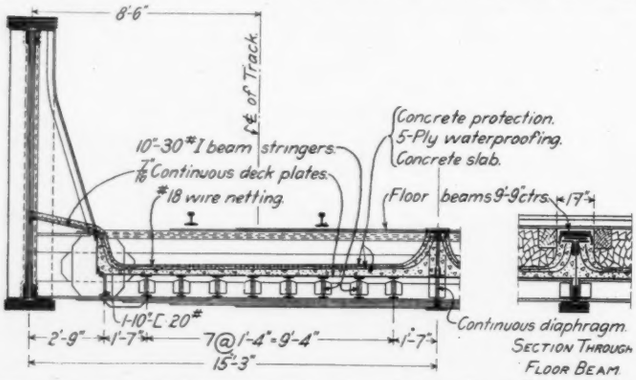
Longitudinal Section Through Pedestrian Subway

ture, with three girders and a ballasted floor. In an effort to improve traffic conditions, an angle is introduced in the east street line half way under the bridge, which necessitates an unsymmetrical structure, the west girder being 106 ft. 6 in. long, the center girder 72 ft. 6 in. long, and the east girder 68 ft. 6 in. long. Pin bearings are used for the long west girder, in order to maintain the coping lines unbroken and to avoid the use of excessively high pedestals under the center and east girders. The pin bearing at the expansion end of the west girder, where rollers are used, is made on the web of the girders, instead of on a casting bolted to the bottom flange.

In order to provide adequate drainage and to minimize the large amount of excavation for the approaches, a bridge with a shallow floor was desirable. To obtain the restricted floor depth and

avoid the undesirable through floor construction, a special design was adopted, consisting of transverse floor beams spaced 9 ft. 9 in. apart with their top flanges as close to the underside of the rails as possible, supporting longitudinal 10-in I-beams covered with a continuous top deck plate.

On the center lines between girders are placed steel diaphragms having the same depth as the floor beams, and attached to the webs of the latter by means of connection angles. These diaphragms are made continuous by means of cover plates passing



Floor Details of the Through Girder Span for the North Pearl Street Subway

over and under the flanges of the floor beams and riveted to them, and connecting the flanges of the successive diaphragms. The object of the diaphragms is to distribute the wheel loads and produce an even deflection in the floor. They also provide a convenient stop for the waterproofing, making practicable the complete waterproofing of one track at a time.

The girders are spaced 30 ft. 6 in. center to center, and the steel deck has a width of 25 ft. 6 in., thus leaving a space 2 ft. 6 in. wide along each girder. Along the outer edges of the steel deck are riveted facia girders with their top flanges at the same elevation as the flanges of the floor beams. This arrangement gives sufficient space for the ties and ballast, reduces the weight to a minimum and permits convenient inspection and maintenance of the floor beam connections. The open spaces are covered by reinforced concrete slabs made continuous with the concrete protection over the waterproofing.

The design of the floor produces depressions or pockets, each of which is drained through nipples screwed into the deck plate

Looking East Down Van Woert Street Approach Under Dudley Avenue

and discharges into longitudinal gutters, which connect with downspouts located in the face of the south abutment, the downspouts emptying into a city sewer. The nipples have flared tops, and extend about 1½ in. above the deck plate, this space being taken up by a course of 1:3 Portland cement mortar carried up against the sides of the floor beams, diaphragms and facia girders. On this mortar course is laid a waterproofing course, consisting of five thicknesses of tarred felt, one of which is reinforced with cotton fabric and six moppings of coal tar pitch. The waterproofing membrane is carried up to the underside of the top flanges. Over the membrane is placed a protection course of mortar reinforced with wire netting.

The bridge carrying Dudley avenue over the Van Woert street approach consists of six deck plate girders spanning the street and supporting on their top flanges I-beams transverse to the roadway, which in turn support the roadway, consisting of a brick pavement on reinforced concrete slabs, and sidewalks of reinforced concrete.

This bridge is designed for the following moving loads in addition to the dead load:

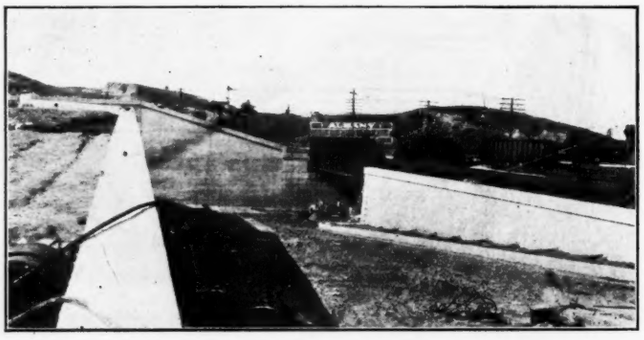
On the roadway two trucks weighing 18 tons each, and a uniform load of 100 lb. per sq. ft.

On the sidewalks a uniform load of 100 lb. per sq. ft.

An impact allowance of $\frac{150}{L+300}$ times the live load stress.

In order to connect with the existing Dudley avenue as laid out, it was necessary to use a 7-per cent grade and introduce about a 29-deg. curve, which of necessity occurs directly at the point of crossing the Van Woert street approach, which is on a 6-per cent grade. The combination of grades, skew and curvature complicated the layout and some ingenuity was required to work out a suitable roadway over the bridge, which is accomplished by warping the surface.

A subway to accommodate pedestrians is installed in the vicinity of the original crossing. The subway is 8 ft. wide and



Looking North—Pearl Street Incline and Subway on Right, Dudley Avenue Approach on Left

has 7 ft. 6 in. headroom. Its floor is reinforced against hydrostatic pressure, the walls are of gravity section and the roof is constructed of I-beams encased in concrete. The whole subway is waterproofed by a continuous membrane consisting of five plies of felt, the middle one being reinforced. This concrete filling between roof I-beams is reinforced with wire mesh laid under the I-beams and securely wired to rods laid across the top.

The subway is drained by a gutter along one wall leading to a sump at the easterly end. From there a pipe with trap and back-water valve carries the drainage to Van Woert street sewer. The subway is electric lighted and has vault lights to give natural light during the daytime. The monotonous appearance of the concrete is relieved by a series of brick panels constructed of buff tapestry brick. The kiosks over the entrance are constructed of cement plaster on wire mesh.

The railroad made all track and signal changes, including the support of the tracks on timber falsework during the construction of the two subways, with its own forces. The other work was done under contract. Substructural and approach work was done by the Walsh Construction Company, of Davenport, Iowa; steel fabrication by the Fort Pitt Bridge Works, of New York City; and the steel erection and waterproofing by the Jobson-Gifford Company, of New York City.

In addition to the track work, the approximate main quantities involved in the improvement are 50,000 cu. yd. of earth excava-

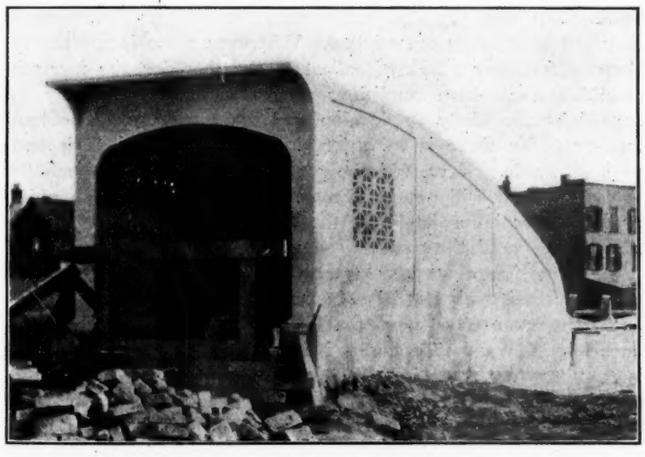
tion, 7,000 cu. yd. of concrete, 30,000 ft. of timber piles, 4,000 ft. of steel sheet piling, 9,000 sq. yd. of brick and stone block pavement, 34,000 sq. ft. of concrete walk, and 500 tons of steel.

Owing to the congested location, and to the fact that westerly from this location the tracks run up grade for a considerable distance through a cut, and on the east the tracks run into the city, the problem of disposing of the excavated material economically had to be solved. This was accomplished by teaming the greater part of it to the Albany Basin improvement on the Hudson river front, where the railroad required considerable filling. Some that could not be used in this way was hauled by train to a point just south of Rensselaer, and used to widen out the roadbed for future additional tracks and strengthening some weak spots in the roadbed in this vicinity.

Considerable trouble and expense was entailed due to the character of the subsoil encountered, which consisted, below the elevation of footings, of about 3 or 4 ft. of blue clay and then a stratum of soft yielding material composed of blue clay, sand and water, for a depth of about 30 ft. to hard pan. As an illustration of the condition of this stratum a 2-in. pipe was driven about 10 ft. into the ground and when some heavy timbers were dropped in its vicinity, a jet of sand, clay and water was forced up through the pipe and about five ft. into the air.

Perhaps the greatest difficulty to be overcome was to allow uninterrupted train movements during the process of constructing the undercrossing and particularly during the erection and waterproofing of the steel bridge. With the exception of causing a little slower movements of trains than usual, the steel was erected and the floor waterproofed free from interference from traffic, by the following procedure:

Falsework piles were driven under tracks 2, 3 and 4, and for a temporary track outside the east girder, the tracks being all shifted to the east after the falsework was completed and before



Kiosk Approach to Pedestrian Subway

the excavation for the abutments was started. In the temporary locations, track 1 was in the permanent location of track 2, etc. The girders were then set in place between tracks, and when everything was in readiness for the erection of the steel floor to support tracks 1 and 2 in permanent locations the traffic on temporary tracks 1 and 2 was carried for twelve hours on track 2, to permit the erection of the floor free from traffic interference. This portion of the work was completed in the time allotted, and track 1 placed in its original position. The erection of floor to support tracks 3 and 4 was carried out in the same manner.

The waterproofing of the floor which carries track 1 in permanent location was first completed free from traffic interference, track 1 was then shifted to its permanent position, and the balance of the bridge was waterproofed in a similar manner.

In taking care of street traffic during the construction period, a point in favor of the method of elimination is emphasized; that by reason of the crossing relocation, traffic along the street has been allowed to go on undisturbed. By an intermediate track shift the original crossings will be undisturbed until street traffic is turned into the new street and undercrossing.

This work was carried out under an order of the Public Service Commission, Second District, dated June 12, 1913, and in accordance with Section 91 of the Railroad law. Under the law the railroad company will pay 50 per cent of the cost of the improvement, the city of Albany 25 per cent and the State of New York 25 per cent. Under the law, the railroad company prepared the plans and did the work. In accordance therewith

Looking West—Tracks on Pearl Street Subway in Foreground Dudley Avenue Bridge Over Van Woert Street Approach in the Distance

the work was done under the supervision of G. W. Kittredge, chief engineer, and J. W. Pfau, engineer of construction. E. B. Menuez, district engineer, at Albany, N. Y., had direct charge of the construction.

THE RAPID IMPROVEMENT OF A SECTION

By Kenneth L. Van Auken

Instances frequently occur where it is necessary to assign a new foreman to a section for the purpose of making a rapid improvement in the condition of the track, to insure safety or to obtain conformity with the required standards. There are many reasons for poor condition of a track, among which might be mentioned, lack of labor or poor labor, an incompetent or neglectful foreman, curtailment of appropriations for track work, track on a new grade, or emergency work, such as washouts, whereby the section forces have been diverted from their regular duties.

When a new foreman is given a section which has been improperly maintained, he will find enough work for ten gangs of the size he is usually allowed. Nevertheless, he will generally be expected to restore the track to the required standard without even the help of an extra gang. Even if an extra gang were furnished, it would be necessary for the section gang to follow out a program of rapid improvement for the entire section in advance of the extra gang. The foreman will probably find that the track needs surfacing out of face. However, there will be certain places which are rougher and need attention worse than others. The foreman should therefore make it a positive rule always to do the most important thing first and he should bear this in mind on starting out from the section house each day

It is very difficult for a section foreman to do this kind of work, which one supervisor has aptly called "skirmishing." As a rule, section forces, both foremen and laborers, are trained

to be thorough, keeping in mind, quality rather than quantity. For instance, they are accustomed to tamp track with tamping bars or picks, dress it up, line up the shoulder and ballast line and leave everything in first-class condition. There are other reasons why a foreman dislikes to run over a section hurriedly, spotting out only the worst places; a good foreman will take pride in his work and will be careful to leave nothing behind him which could be criticised by another good trackman or which he could not be proud of himself. Sometimes the foreman will even go so far as to neglect or ignore the orders of the roadmaster, who is constantly riding over the track and is therefore able to locate the roughest spots, or he may postpone fulfilling his superior's instructions because he is trying to complete some other work. This is a great detriment to the work in most cases and should not be allowed. To prevent this the roadmaster should check up carefully to see that his orders are obeyed immediately. On the other hand, there are many foremen who would improve the section quickly and do only the work which requires immediate attention if they knew just what was necessary or had had some experience in this class of work, and it is believed that the following hints may be of value to such men.

Of course, the first thing which a foreman will do on taking over a new section is to make a trip over it on a hand car or motor car, or possibly walk over it, to familiarize himself with the conditions on the section. When making this preliminary inspection he should look carefully for dangerous places in the track, such as low joints on the high sides of curves, low bridge approaches, alinement at highway and railway crossings, the condition of switches (especially facing point switches), low joints alternately on one side and then on the other, skeleton track or track without a shoulder of ballast, churning ties, etc. He may be able to make the inspection thorough enough to make recommendations regarding water pockets, slides, or soft spots in cuts. He can then order the ballast or other material necessary to put the track in a safe condition.

As in all other work, the most important part of the foreman's duties is to lay out the work in the order in which it is to be done. If it is desired to cover the entire section in ten days, for instance, the foreman should divide his section into approximately 10 equal parts, unless some natural division points, such as bridges, suggest themselves. It may also be necessary to lay out unequal sections because some parts of the track will require much more work than others. The foreman should determine, however, to cover his entire section in not more than ten days; seven days would be even better. When raising bad spots, the foreman will find it advantageous to walk ahead of the gang in the morning with a piece of chalk, marking the joints which he wishes to raise by two crosses on the base of the rail, one on each side of the joint, locating these crosses so that they will include between them all the ties that it is necessary to tamp at that particular point. After the foreman has marked off the places on the section which he intends to cover that day, he should return to the gang immediately.

As it is only possible to employ a few men when beginning any piece of work, for instance in surfacing, it is advisable to take part of the gang ahead when there is still some dressing up to be done, leaving the remainder of the gang to finish. After a sufficient amount of track has been raised, the remainder of the gang, with the exception of possibly one man, may be brought ahead. In this manner all the men can be kept constantly at work. The same holds true when lining up a highway crossing. As it will be impossible to employ all of the men in taking up the crossing planks without carrying an unusually large number of lining bars, pinch bars, etc., the work of tearing up the crossings should be done preferably by a few men while the others are finishing up the preceding job. Likewise, after the low joints have been raised in a crossing and it has been lined, all of the gang save two may be taken ahead, leaving these two to replace and spike down the planks and do whatever dressing is necessary.

Wherever a little gaging or spiking is necessary, a couple of men should remain to do this work, though they should if possible be kept in sight of the foreman. It may sometimes be necessary to take a good share of the gang out of sight of two or three of the men; for instance, around a curve in a cut, and in this case the foreman should leave men whom he can trust to keep at work, even though they are not under direct supervision.

The curves, of course, will require prompt attention. Low joints, in the high side of the track especially, may cause a derailment and wide gage is dangerous. It is possible during the preliminary inspection, to spot cases of wide gage by noting places where the outside rail has drawn away from the inside spike. Bridge approaches will almost always require some attention and they should be raised at least 100 ft. or more back from the bridge rather than only one rail length, as is frequently done. The track should be raised about two inches, particularly if the embankment is settling rapidly, thus obviating the necessity of giving the bridge approaches further attention until after a storm. The foreman should be careful when raising bridge approaches not to run too far back on the track (as he will often be tempted to do because the track is rough), but he must remember that there are other places which need attention first.

Usually the track through highway crossings is neglected because of the extra work involved in taking up and replacing the planks. Of course, this is the result of slovenly work, but when a section has deteriorated through any of the causes previously mentioned, usually the crossings will have suffered. The foreman should be careful to take out the local kinks at the crossing but should also be sure that the track lines up properly with the tangent for some distance each way before he puts down the planks again. The same might be said of railroad crossings, but as it takes a long time to line these up correctly it would be best to let them remain until after the preliminary work on the entire section has been done, unless they are very badly out of line. Wherever there is a piece of skeleton track, or a lack of ballast on the shoulder, the foreman should correct these conditions at the earliest opportunity as sun kinks are likely to develop and cause wrecks. The best treatment for these is to order the gravel and spread it just as soon as it arrives. If the gravel is spread in the middle of the track it will not be necessary to dress off the shoulder or the center immediately, as the weight of the ballast will be sufficient to hold the track.

Churning joints are quickly recognized by a good trackman and will receive his attention in running over the track for the first time, because he knows that the seriousness of the condition does not show up in a case of this kind except when a train is running over the joint. A joint may appear to be only two inches low, but since it has no foundation it may sink three or even four inches when the wheels of a train pass over it. Churning joints should therefore have early attention.

To summarize, the preliminary work of a foreman on a new section should be confined first, to places which are actually dangerous, and second, to such other places in the track as are in particularly bad condition compared with the rest of the bad track on the section. The foreman who will pocket his pride and quickly improve the worst spots, will probably escape the censure of the roadmaster and higher officers and gain for himself credit for having improved the track materially in a very short space of time.

EARLY RAILROADING

The Columbia & Philadelphia Railroad, now a part of the Pennsylvania Railroad, was completed as a single track line in 1834. At first all freight was hauled by teams, and because of battles between opposing teamsters in the first year, it was at once double-tracked. Excepting the inclined planes at Columbia and Philadelphia, the first 1,800 ft. long and rising 90 ft., and the second 2,805 ft. long and rising 187 ft., the maximum grade of the road was 30 ft. per mile, and the minimum radius of curva-

ture 631 ft. The track was mainly constructed with stone blocks and edge rails, with wooden sills at intervals. The rails were secured to the stones by spikes driven into locust plugs inserted into holes drilled for the purpose. To overcome the tendency to spread, 7-in. by 7-in. ties 7 ft. 6 in. long were added at 4-ft. intervals. The first locomotives drew 20 tons of freight over the 82 miles in 10 hours.

The trip from Philadelphia to Pittsburgh was made by the Columbia & Philadelphia, from Philadelphia to Columbia, by canal along the east bank of the Susquehanna, thence across to the west bank and along the Juniata to Hollidaysburg; then by the inclined planes of the old Portage Railroad over the Allegheny mountains to Johnstown and thence by steam packet down the Kiskiminetas and Allegheny rivers to Pittsburgh. (Journal of the Franklin Institute, 1840.)

CONCRETE FLOOR TROUBLES

By MacRae D. Campbell

From the large number of methods advocated as preventives or remedies for concrete-floor troubles, it might seem to the uninformed that concrete is unsuited to floor construction. This is far from the truth, as concrete is as efficient in floors as in walls or any other part of a building. With concrete floors laid with care, using the best materials and workmanship, none of the too frequent complaints should prevail.

One of the most frequent causes for complaint is "dusting." Extensive investigations have conclusively fixed the cause of this trouble on the failure to observe one or more of certain fundamental requirements, which if observed would have led to success. Dusting may have its cause in any one of quite a formidable list of omissions. The strength and wearing qualities of a concrete floor, particularly the wearing quality of the surface, depend very largely on the quality of material used in making the concrete, the kind of workmanship displayed in placing, and also on the proper protection of the concrete for a sufficient period to complete the early hardening of the floor.

Contributing causes of dusting have been definitely fixed in the use of too fine sand, dirty sand, soft sand, too lean a mixture, improper or insufficient mixing, too much time allowed to elapse between placing and finishing, using mixtures too dry or too wet and the use of dryers (dry cement with or without sand) to dry out the surface so that it may be quickly troweled to the desired finish, permitting the surface to dry out so rapidly that there is insufficient water present to complete hydration or crystallization of the cement, that is, neglecting to protect the surface with a moist covering of earth until early hardening has been completed.

In two-course work when a thin top or wearing surface is placed on a base which has already hardened, there is likely to be dusting because there is no possibility of the base absorbing the excess water from the top course and any excess must get away through evaporation from the top surface. This excess of moisture on the surface prevents troweling to the desired finish until after early hardening has commenced, or invites frequent troweling which results in bringing an excess of cement to the surface and separates some of it from the aggregate and thus impairs the wearing quality of the surface.

Disposing of the question of cement used in floor construction by stating that any one of several well-known brands are known to be manufactured so as to meet specifications of the American Society for Testing Materials, particular attention must be given when preparing concrete mixtures for floor construction, to selecting clean, hard, durable, well-graded aggregates and to proportioning them so that voids will be eliminated as nearly as possible. The use of granite screenings for aggregate in the wearing course to insure a harder and more homogeneous surface has met with considerable success. Various hard or flinty sands and even garnet and carborundum grit have been used in the top course and show remarkable resistance to abrasion. But dusting is not necessarily the result of abrasion of aggregates, rather it is the result of improper bond between the cement and fine aggregates which permits the fine particles of grit to become loosened from the cement binder, thus subjecting the cement itself to the wear of traffic. This goes on repeatedly after a manner that might almost be referred to as disintegration. This fault, provided materials have been all they should be, results solely from failure to protect the finished concrete by means of a covering of moist earth or sawdust for from 10 days to two weeks to insure complete early hardening.

Materials can be governed by specifications and although it is possible to specify careful supervision and workmanship, it is not always possible to define what these mean or to secure them after having defined them. Since so many thoroughly satisfactory concrete floors have been obtained by following the specifications of the American Concrete Institute, it should be evident that dissatisfaction with other floors results from the neglect of some vital factor.

Floor requirements in certain types of railroad construction are well met by concrete. Some stations may be advantageously floored with concrete; and such construction is adapted to machine shops and roundhouses. Fault is sometimes found with concrete floors in machine shops and roundhouses where naturally much oil is spilled on the surface in the course of time and claims have been made that oil causes disintegration of concrete. This is hardly tenable since there are many instances where concrete oil storage tanks have given satisfactory service and after years of use, a careful examination of the surfaces exposed to oil show no disintegration. The secret of success lies in a well-proportioned concrete mixture that produces an impenetrable surface as well as mass.

There are a number of treatments that may be applied to floors that have caused trouble from dusting, which will allay this trouble, but most of these require renewing from time to time. A mixture of linseed oil and turpentine has been found effective when painted on the surface, likewise a treatment consisting of several applications of a sodium silicate solution which acts by combining with free salts in the cement to form an insoluble compound. In some cases the top may be ground down with one of the common types of floor polishing machines as is done in polishing or surfacing mosaic floor.

This brings to mind the suitability of what are commonly referred to as terrazzo floors, for stations, sometimes referred to as Venetian floors. Careful cost figures that have been kept on many pieces of such construction show that terrazzo or Venetian floors may be laid for a lower cost than any other form of decorative floor. Marble mosaic averages from 60 to 75 cents per sq. ft.; ceramic tile, 35 to 50 cents per sq. ft., and terrazzo, from 20 to 30 cents per sq. ft.

Just as there is in all construction work considerable difference of opinion as to so-called best methods, so there is a wide variation in the specifications which have been drawn up by different engineers, architects or builders covering terrazzo floor construction. This floor has a number of attractive possibilities. There is no limit to the variety of surface finish which may be secured by carefully selecting the aggregate. Crystalline limestone of all obtainable colors may be used singly or in combination. Relatively soft aggregates of uniform hardness are desirable. Different kinds and colors of marbles also may be used, and likewise the cement mortar in the mixture used to bond or bind the particles together and in place may be varied in color by the use of mineral pigments. The finished terrazzo floor should show not less than 80 per cent of aggregate surface.

Terrazzo floors are laid both on the top of a concrete base supported by an earth foundation and over wood or exposed steel sub-floor construction. In the last two cases the terrazzo should be underlaid with a well-lapped course of hard roofing felt or waterproof building paper. The foundation course should consist of concrete mixed in the proportions 1:2½:4. Enough water should be added to make a medium wet consistency. Concrete should be deposited 4 in. thick. Upon this foundation course there should at once be laid a ½-inch layer of 1:2 cement mortar. Within 24 hr. after placing the foundation, a ½-in. to 1-in. layer

of cement and marble chips, or whatever aggregate for the surface is selected, should be mixed to the consistency of a stiff paste and deposited. The marble chips should vary in size from a pea up to ¾ in. in the largest dimension. The proportions of this mixture may vary from 1:½ to 1:2½. The cement marble layer should be spread so evenly that the broad surfaces of the marble particles will turn upward, then should be tamped thoroughly and rolled with a heavy roller weighing not less than 100 lb. to the foot, and preferably more.

After protecting this surface with a moist covering for two or three days, the preliminary surfacing or grinding may be done by using a lubricant of water and pure cement, grinding being done by one of the rotary types of floor polishing machines. In 10 days or more the floor may be ground again to its final surface. The degree of polish will depend upon the hardness attained by the cement and the thoroughness with which it has been protected during hardening. Ingenuity of the individual worker will suggest quite a variation in details of terrazzo construction. There is a considerable latitude for introducing pleasing border effects, even inlaying certain designs in the floor proper.

Frequently the question arises as to the necessity for using reinforcement in the floor when a terrazzo surface finish is contemplated. Best practice seems to indicate that for areas of 75 sq. ft. or less, or in buildings where all settlement has occurred and further settlement is not likely, or in places where the underlying floor slab is thick, say from 4 in. upward, reinforcing is unnecessary. It seems advisable, however, to introduce suitable reinforcing in locations where the construction may be subjected to constant vibration, in new buildings where there is certain to be subsequent settlement, where the concrete floor slab is not very thick, and where the terrazzo is to be laid over wood subfloor construction.

LINING A DOUBLE TRACK RAILWAY TUNNEL UNDER TRAFFIC

By Rodman Meacham
General Manager, Meacham Contracting Co., Hopkinsville, Ky.

The Diana tunnel of the Louisville & Nashville is located about 65 miles south of Nashville, Tenn., on its new double track, low grade main line to Birmingham. The tunnel is 1,520 ft. in length. It was excavated through limestone and shale formation, and required temporary roof timbering throughout. This timber had to be removed in the north end for the concrete section, but was left in place in the south 1,200 ft. of the tunnel, where, after it was demonstrated that timbering would be necessary, the excavated section was enlarged.

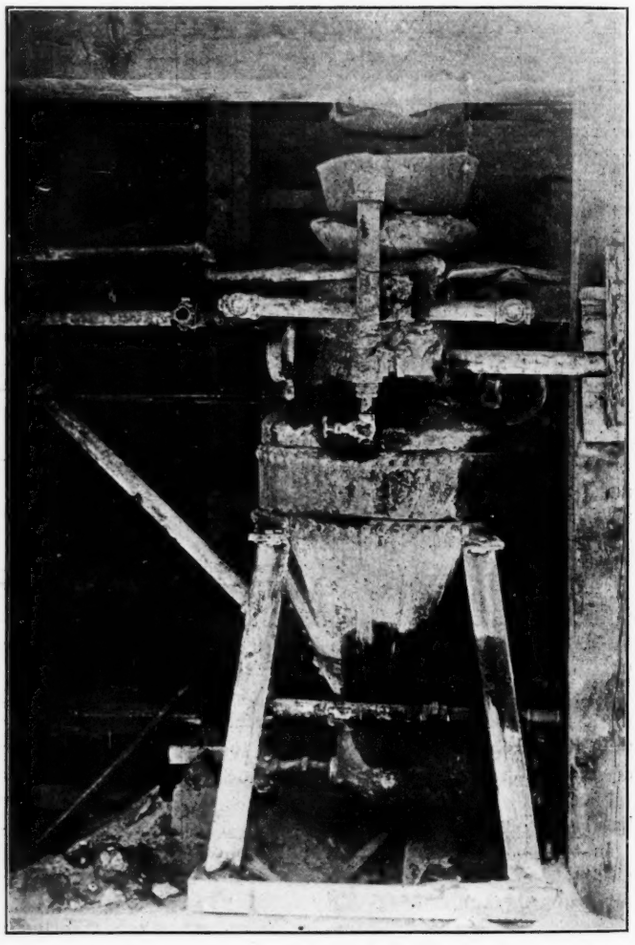
It was the intention at first to pour the side walls, using an incline and hoist to elevate the cars of mixed concrete up to the springing line, where they could be dumped directly into the side walls, and the concrete for the arch section to dump on a platform and shovel and pack it into the arch by hand. After investigating the pneumatic method of placing concrete, however, the estimate indicated the economy of blowing concrete through an 8-in. pipe directly into place, using a steel tunnel form built to the full section of the tunnel. This method permitted trains to pass through the tunnel without interfering with the concreting work and made it possible to pour the full section of the tunnel in a single operation. It also eliminated a cumbersome incline and hoist which probably would have caused some delays to the regular traffic of the road.

The pneumatic method was therefore adopted for the work, in conjunction with two 35-ft. sections of steel forms of the Blaw type, built on travelers. The work was started on January 19, 1915, and was completed on October 22, a total interval of nine months, during which there was an average of 20 trains per day through the tunnel, with a total delay of traffic of less than two hours. This is considered unusual, as some delays were fully expected. The speed of all trains through the tunnel was restricted to six miles an hour while the work was in progress.

FORMS

The traveling forms are shown in the accompanying drawing. They consisted of steel plate side walls to the springing line and 2½-in by 5½-in. yellow pine lagging over the arch section. The side walls were stiffened with vertical I-beams and two waling pieces of two 4-in by 8-in. timbers placed horizontally against these I-beams, through which anchors passed. These anchors were fastened to the rock side walls with split point anchor bolts set into the rock about 10 in. to afford rigid supports for the side wall forms.

Two diagonal tie rods and one horizontal tie rod were also placed near the bottom of the form to hold it rigid while being moved, but these were found unnecessary after the first move and were discarded, thereby removing all obstructions to traffic. It was necessary to build the footing course of concrete ahead



View of the Pneumatic Mixer Set Up Under the Bins at the North Portal of Diana Tunnel

of the forms so that the bottom steel plate would fit up against the concrete footing, as shown in the sketch.

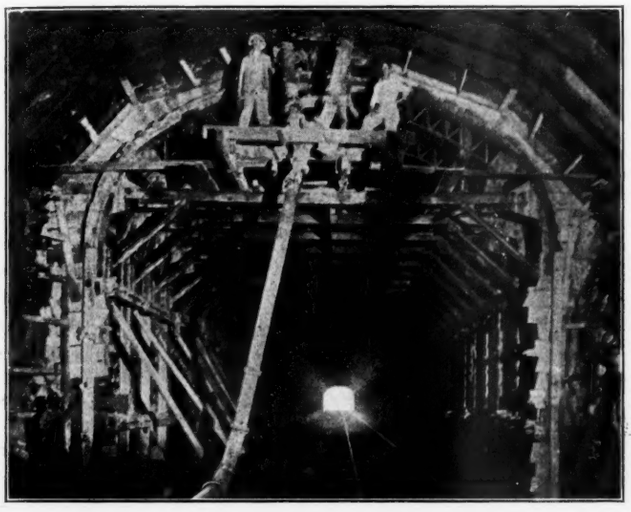
In moving the forms the doors M-7 at the haunch of the arch were first opened. The 16-in. jacks were then lowered about 2 in., bringing the arch section away from the concrete. After this, the diagonal braces B-1 were unbolted and the turn buckles M-1 were pulled in to move the side walls away from the concrete at the springing line of the arch. The wall forms were pulled away from the concrete at the base by inserting a crowbar between the rails, on which the forms traveled, and the steel frame which carried the wheels, and prying the forms away. This was possible, as there was enough play in the wheel axles to allow for the side movement.

The forms were first set up at the south end of the tunnel, one at the portal and the other about 350 ft. in. As the lining was placed they were moved north 35 ft. at a time until form

No. 2 reached the center of the tunnel, and form No. 1 reached the starting point of form No. 2. After form No. 2 reached the center of the tunnel it was moved ahead to a point about 350 ft. from the north end, and form No. 1 was moved ahead to the center of the tunnel to continue the work where the other form had left off.

THE PNEUMATIC MIXER PLANT

During the first half of the work the pneumatic mixer was located about 75 ft. outside the south portal, after which it was moved to the north portal. At the south end the mixer was in a deep approach cut and the top of the cement house and of the stone and sand bins erected above the mixer was some 30 ft. below the top of the rock sides of the cut. A large pile



View Showing "Y" in Delivery Pipe, Forms and Roof Timbering

of spoil rock excavated from the tunnel had been deposited on the east side of the cut above the mixer plant. This rock was crushed on the site, screened and dropped through a gravity chute into the bin below within the cut. Sand was brought in cars from Jacksons Lake, Ala., and unloaded into the bins by means of a derrick set at the top of the cut, which handled a large bottom-dump bucket.

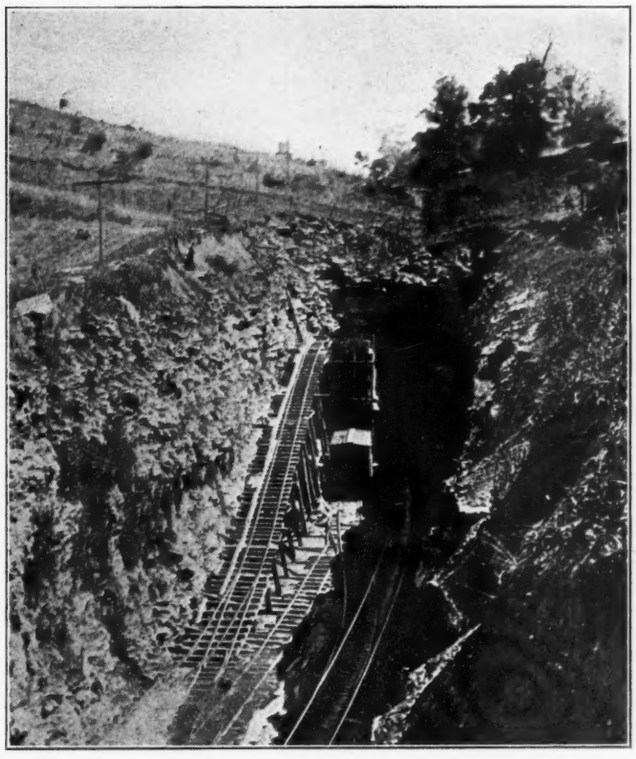
When the bins were built, the mixer was placed beneath with a measuring hopper directly above it for measuring 10 cu. ft. batches. A working platform was built at a convenient level for the measuring hopper. This platform was extended to the full area underneath the bins and was used for cement storage. The bins for stone and sand above contained space for about 140 cu. yd. each. The cement storage capacity was about four cars.

METHOD OF HANDLING

From the pneumatic mixer an 8-in. standard steel pipe was carried to the forms. The pipe was laid along the ground. At the forms it turned vertically with a long radius, 90-deg. elbow, and at the top just before turning horizontally through the bulkhead over the crown of the arch it was divided by means of a "Y" connection into two 8-in. lines which passed over the crown of the arch. The "Y" connection is particularly useful in a double track tunnel where the width of the crown is so great that it is difficult to change the pipe rapidly in directing the concrete from one side wall to the other. As shown in one of the photographs, it consists of a casting with "Y" branches at about 22½ deg. deflection. The concrete passes through one of the branches and is obstructed in the other branch by means of a sliding plate. To switch the flow of concrete from one branch to the other, it is only necessary to slide the plate from one side to the other. This is done by a couple of blows from a sledge and requires but a second's time, so that it may be accomplished after one batch has passed and before another batch is blown through, without the necessity of holding up or even notifying the operator of the pneumatic mixer.

The two 8-in. pipes passing over the crown of the arch reach about 20 ft. or midway into the forms, and at that point they turn through 90-deg. elbows to each side wall. At the end of the elbow a 9-ft. length of 8-in. hose is suspended. While the concreting is going on two men with ropes attached to the end of this hose station themselves at the ends of the form so that they can pull the hose forward and back and deposit the concrete evenly along the side wall. After sufficient concrete has been poured to bring the side wall up from 2 to 6 ft., depending on the thickness, the concrete is diverted through the other side of the "Y" and deposited in the opposite side wall to balance the weight against the forms.

When the concrete reaches a point too high for the use of the hose, this is detached while concreting is going on at the other side. Concrete is then discharged directly from the elbow until the space is filled close to the end of the elbow. During this period of the pouring the concrete is distributed by means of hoes and concrete rakes. This brings the level of the concrete up to a point nearly level with the top of



Looking South Toward the Mixing Plant Set Up at the North Portal of Diana Tunnel

the barrel of the arch form, and leaves remaining to be filled a space approximately 10 ft. wide and from zero at the sides to 18 in. in height over the crown. The 90-deg. elbows are then removed from the ends of the pipe and a short hose is attached to one of the 8-in. pipes, the other pipe being removed. Concrete is then shot against the rear and built up to the end of the hose, after which this hose is removed and the concrete is shot straight ahead from the end of the pipe until the key is completed.

At the north end of the tunnel the temporary timbering was removed as concreting progressed. Considerable breakage in the roof left cavities of various depths which it was necessary to fill either with concrete or with some variety of packing. Where packing was used it was placed with the pneumatic machine. The material consisted of a mixture of 75 per cent limestone screenings and 25 per cent sand. This was blown in, filling the cavity completely and packing it tightly so that the

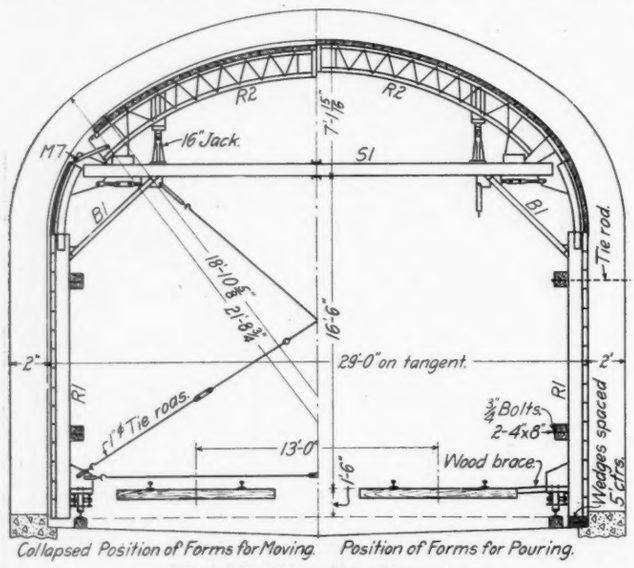
weight or any pressure from rock settlement was evenly distributed over the barrel of the arch through the packing.

The compressor plant consisted of two Ingersoll-Rand steam-driven compressors, which delivered about 1,000 ft. of free air per minute at the mixing plant. The same steam plant and a Cameron duplex pump furnished water for construction purposes and for the camps.

GENERAL

After the mixer plant was moved from the south to the north portal the crusher plant was located about 2,000 ft. north of the mixer. This required handling the crushed material in 4-yd. narrow gage dump cars hauled by dinky locomotives. These cars were hauled from the crusher plant to the base of an incline at the bins and were pulled up the incline by means of a cable from a Munday hoisting engine, located under the bins. A view of this plant as located at the north portal is shown in one of the photographs.

It was found that the 8-in. pipe used wore out first at the joints, as the pipe was thinnest there on account of the threads.



Cross Section of the Tunnel

At the beginning of the work 1,000 ft. of standard pipe was purchased, and after the work was half completed 300 ft. of well casing with Van Stone joints was purchased. This well casing was found to be well adapted and did not give trouble through the wearing at the joints that the standard pipe did. Another advantage of the Van Stone joints was their flexibility, as about 5 deg. deflection could be obtained in this joint without straining the flange. Of the entire amount of pipe purchased, which was bought second-hand, about half was still in very good condition at the close of the work, after having some 11,000 yd. of concrete blown through it.

The elbows used consisted of cast manganese steel and of bent pipe. The manganese steel elbows were purchased at the beginning of the work and were still in good shape at the end, having shown very little wear. The manganese steel elbows were, however, very heavy, weighing about 400 lb. for a 90-deg. bend. For this reason the pipe bends were used over the crown of the arch, where the handling of the pipe was difficult. The pipe bends weighed about 125 lb. each and were worn through on the outside of the curve. When worn through a "half sole" or patch was clamped over the worn part, which usually lasted for another 500 yd.

At the beginning of the work the engineers permitted the moving of the forms after six days, but after a time this period was reduced to four days. In all there were 41 form sections, each of approximately 35 ft. and containing about 250 cu. yd. in each section. The longest distance which concrete was transported was 925 ft. and the average distance was about 400 ft. The average time required to concrete one 35-ft. section was approximately 24 hr., although some forms were filled in 15 hr. The number of men required to mix and place the concrete was 13, including 3 men in the bins, 1 operating the gate levers, 1 to level off the measuring hopper containing the batch, 1 man on cement, 1 mixer operator, 1 man on the conveyor pipe, 1 attending to the bulkheads and 1 foreman and 4 men helping in the forms. A gang of 10 men was employed constructing footings and moving and setting the forms.

The work was done by the Meacham Contracting Co., Hopkinsville, Ky., sub-contractors for Walton & Co., Falls Mills, Va., who excavated the tunnel. C. B. Fritchie was superintendent in charge of the work for the Meacham Contracting Co.

The forms were furnished by the Blaw Co., Pittsburgh, and the pneumatic mixer and conveyor was furnished by the Concrete Mixing & Placing Co., Chicago. The work was done under the supervision of H. C. Williams, chief engineer of construction for the Louisville & Nashville, and Geo. B. Bryson, resident engineer in direct charge for the railroad.

MAINTENANCE OF WAY MASTER PAINTERS' CONVENTION

The Maintenance of Way Master Painters' Association held its twelfth annual convention at the American Hotel Annex, St. Louis, Mo., on October 19, 20 and 21, with about 40 members and guests in attendance. Owing to vacancies in the offices of president and secretary-treasurer, F. C. Rieboldt (C. M. & St. P.), Milwaukee, presided and E. H. Brown (Painters' Magazine), New York, acted as secretary.

Martin Kane (D. & H.) read a paper on the sanding of depots and other structures. Sanding is a necesasry evil because only by adopting this process is it possible to preserve the interior finish of some stations, particularly the toilet rooms. He has found it possible to obtain a white finish by the use of white sand. J. T. Lewis (Wabash) stated that this road sanded the outside, but not the inside of its stations and that it was his experience

Sign Painting Crew with Outfit Motor Car and Crossing Sign Scaffold

that while sanding prevented writing, it did not necessarily prevent carving. A. E. Wilson (N. Y., N. H. & H.) and Charles Johnson (C. & N. W.) reported a tendency of sanded paint to peel on certain classes of wood.

A. E. Wilson (N. Y., N. H. & H.), Hartford, Conn., read a paper on the proper method of cleaning bridges and other steel structures. He called attention to the fact that the maintenance of way painter had conditions to contend with that did not concern painters in other lines, such as brine drippings, hot cinders, contraction and expansion, engine gases, etc. Unless the fine rust is removed from steelwork corrosion continues under the coating, regardless of the paint used. It was his experience that the only way to clean properly was by means of the sand blast. Heavy scale may be removed by means of hammers and chisels, but the fine rust next to the steel can be removed only by the blast. He

has found this method much cheaper than hand work and also much more permanent. The machine he uses is a 150-ft. machine which can also be used for general work, such as drilling, riveting, etc. It supplies air for two nozzles. It is advisable to have the painters follow the sand blast very closely with the paint, as iron takes a light coat of rust very quickly. H. B. Wilson (B. & L. E.) and J. H. Barkley (I. C.) reported higher cost with the sand blast than for hand cleaning. Attention was called to the expense of spuring out the compressor car for anything but a very large job. H. E. Conrad (P. R. R.) called attention to the advantage of the sand blast where compressed air was available from interlocking plants or other sources. M. F. Ebel (C. H. & D.) reported trouble with pin point rust spots on surfaces painted over sand blast work.

A paper on the method of painting maintenance of way signs was read by O. Stubstad (C. & N. W.), in which he advocated the painting of signs on the ground rather than taking them up and painting them in the shop. The equipment for this work is restricted to what can be placed on a hand car and consists of a scaffold composed of two U-shaped bars and two planks, a 7-ft. ladder, paint and brushes. The crew consists of three painters and the foreman. The operation consists briefly of hanging the U-shaped bars over the sign and laying on the planks, the whole being arranged so that a painter sits on each side of the sign. First they paint the sign white and then with a little clean waste rub the fresh white paint off the black letters and retrace them with a 1-in. flat varnish brush. While the two painters are thus engaged on the sign, the third man paints the flanger signs, whistle posts, etc. After a little experience the men complete one sign in 35 min. and cover an average of 7½ miles of line per day. This progress was with a hand car. After a motor car had been substituted more progress was made, not only because of the speed with which the men were transferred from one sign to the next, but because of the better time made on the signs, the average being reduced to about 25 min. The men had an opportunity to rest while being moved rather than becoming tired from pumping the hand car. According to the method outlined, all the work was finished up at one time and no second trips were required except when it was necessary to do two-coat work on signs which were in bad condition. It is not advisable to do this kind of work during the hottest part of the summer, as the reflection of the sign in a man's face combined with the direct rays of the sun on his back are almost unbearable. Experience is also reported in connection with the new signs required in the state of Minnesota, in which red letters are specified. Difficulty was experienced because of the tendency of the red paint to bleed into the white. M. F. Ebel, H. B. Wilson and Martin Kane disagreed with the author of the paper and favored making two trips over the line, one to paint the body of the sign and the second to stencil on the letters. It was their opinion that tracing over the old letters was much more expensive than stenciling.

"Railway Paint Specifications—Why?" was the title of a paper by Philip L. Maury (The Sherwin-Williams Company). Other questions discussed on the floor were: The Oil Waxing and Varnishing of Hardwood Floors in Station Buildings; Door Jambs; Fillers for Checked or Cracked Plastered Walls; Method of Treating Smoke Stacks; Best Formula for Treating Galvanized Iron Before Painting; Treatment for the Ends of Steel Girders, and Methods of Treating Office Furniture.

The question, "Shall the Maintenance of Way Master Painters Unite or Amalgamate with the Master Car and Locomotive Painters," brought forth considerable adverse comment and led to the unanimous adoption of a resolution that it was the sense of that association that they do not amalgamate with the Locomotive and Car Painters' Association.

In the closing business Philadelphia was selected as the place for the next convention, to be held on October 17, 18 and 19, 1916. The following officers were elected: President, Fred. C. Rieboldt, C. M. & St. P., Milwaukee, Wis.; first vice-president, H. E. Conrad, P. R. R., Huntington, Pa.; second vice-president, A. E. Wilson, N. Y., N. H. & H., Hartford, Conn.; secretary-treasurer, F. W. Hagar, F. W. & D., Fort Worth, Texas. An executive committee was appointed by the president consisting of J. H. Barkley, I. C.; A. B. Phelps, N. Y. C.; Martin Kane, D. & H.; H. E. Conrad, P. R. R.; O. Stubstad, C. & N. W.

PAINT AS AN AID IN MAKING THE PUBLIC MORE FRIENDLY TO THE RAILROADS

By EDWARD HURST BROWN
The Painters' Magazine, New York

The current time table of the Delaware, Lackawanna & Western contains an editorial the opening paragraph of which is so much in line with the thought that suggested the subject I have chosen that I will quote it here: "Realizing the value of a good first impression whenever opportunity offers, the Lackawanna Railroad has endeavored to transform the ugly and commonplace into something more inviting and to contribute its share to the town's attractiveness by beautifying the station surroundings, thereby making them a credit to the town and railroad alike."

This policy shows not only a liberal spirit on the part of the railroad management, but it indicates also that the officers of this road have caught the trend of public sentiment in this country. There is a civic pride in every community which prompts it to put its best foot forward. Every town, no matter how small, wants to make the best possible impression upon strangers, whether they are visiting in the town or passing through it. The railroad station is naturally the first building that the stranger sees, and first impressions are very strong.

To many railroad officers the only use for paint on the station building is to preserve it from the ravages of the elements. Standard colors are chosen because they are cheap or because a station can go for a long time without repainting if a dingy iron oxide paint trimmed with black or some other equally cheerful color scheme has been chosen as the standard station color. But citizens judge the railroad by the condition of its buildings in their own town, and if this is such as to cause passengers on trains to get a bad impression of the town, one can be pretty sure the railroad will not have very many strong friends in that particular place.

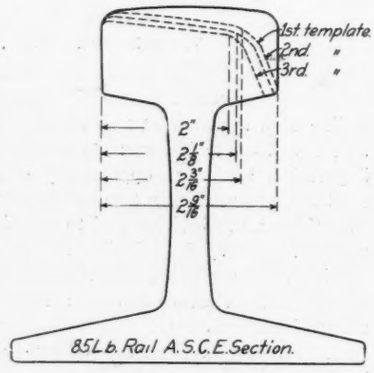
A few years ago a trade newspaper man of St. Louis, Allen W. Clark, conceived the idea of educating the public to an appreciation of better surroundings, to the beautifying of the towns with flowers and shrubbery, and to keeping their houses better painted. He started a movement that has grown to great proportions. Influential trade organizations have backed up this movement and subscribed liberally to it. Local boards of trade and health departments have given valuable assistance and the campaign has become a great movement.

Will our railroads do their part by cleaning up and painting stations and other buildings and thus make this country of ours a cleaner, neater, brighter America? If they do assist in the good work, if they show they are in touch with a movement that is making toward national prosperity and developing a spirit of civic pride in our various communities, they will win the good will of the people. They can endorse this movement in a practical way by keeping their station grounds clean, and planted with flowers where possible, and their stations well painted, and also make some effort to replace the commonplace color schemes that so many roads have adopted with more attractive combinations of colors, selected by men whose training has made them students of color harmony, and whose knowledge of the properties of paint and pigment will enable them to combine utility and durability with attractiveness and good taste. Let the railroads be the first and not the last to clean up and paint up. Then they will truly find that paint is a great help toward winning friendship of the public.

SYRIAN RAILWAY EXTENSION.—It is reported that the railway line from Isilahie to Radju was opened on October 20. The Syrian Railway thus extends some 20 miles nearer the already completed tunnel at Bakdje. The section of the railway just opened is part of the line which, when completed, will link Aleppo with Alexandretta and join up the Syrian Railway with the Konia-Adana line.

A TEMPLET FOR CURVE-WORN RAIL

At a recent convention of the Roadmasters' Association, much interest was shown in the discussion regarding the time when curve-worn rail should be removed from the track and various limits were suggested. William Shea, roadmaster, Chicago, Milwaukee & St. Paul, Ottumwa, Iowa, has prepared three templets, duplicates of which he has given each foreman for his use in determining when the rail on the high side of curves should receive attention. These templets were prepared for 85-lb. A. S. C. E. rail, which is the section generally used on that division. This rail has a head 2 9/16 in. wide when new. When the rail is worn to the point that templet No. 1, with a width of head of 2 3/16 in. fits it, the foreman notifies the roadmaster. When the rail is worn to a point corresponding with templet No. 2, with a 2 1/8 in. width of head, the foreman makes a further report, following which the roadmaster personally inspects the rail and orders new rail to replace it. When the rail is worn to correspond with the third templet with a head of 2 in., it is replaced with new rail. By this method the roadmaster is kept advised regarding all rail seriously curve-worn and a uniform standard of renewal is maintained instead of leaving each individual curve to the judgment of the foreman in charge of that respective territory.



Templet for Measuring Curve-Worn Rail

TIE PURCHASES IN CANADA DURING 1914

A bulletin prepared by the forestry branch of the Canadian Department of the Interior under the direction of R. H. Campbell, director of forestry, reports the purchase of 19,403,646 cross ties, valued at $8,664,914 during 1914 by Canadian railways. The companies reported comprise 47 steam railways and 31 electric railways. Of the total number purchased 1,447,576 were treated with preservatives. This represents 7 per cent of the total against 10 per cent in 1913.

The cross ties purchased in 1914 showed a decrease of 2.4 per cent from those of 1913, while the decrease from 1912 to 1913 was 6.7 per cent. Jack pine makes the most suitable tie material of the cheaper, more abundant woods of Canada. It has headed the list since 1911, when it took the place of white cedar, a more durable wood, but one of which the supply is rapidly becoming exhausted. These two woods have formed the greater part of the ties purchased in past years and together form over half the total in 1914.

The average price paid for ties by the railways in 1914 showed only a slight increase over 1913. The prices in the last five years have been as follows:

1910	38 cents
1911	39 cents
1912	44 cents
1913	43 cents
1914	45 cents

The accompanying table shows the ties bought by steam railways in Canada in 1914. In June of that year there was about 38,000 miles of steam railway right of way in the Dominion. Over 32,000 miles of this was in operation and ties had already been laid on practically all of the remaining mileage. The total number of ties purchased by the steam roads in that year, 19,196,208, represents an average of 500 ties to the mile. A large proportion of these, however, were used on new construction at the rate of about 3,000 ties to the mile.

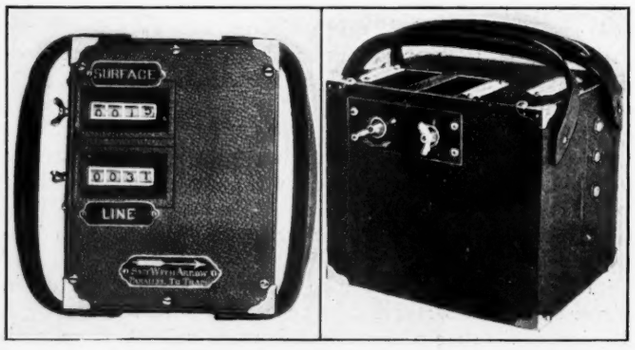
Detailed Record of Ties Purchased by Steam Roads in Canada in 1914.

Kind of Wood.	Number.	Value.	Av. Val.	Per cent.
Total	19,196,208	$8,545,057	0.45	100.0
Jack pine	8,355,518	3,610,885	0.43	43.5
Cedar	2,574,920	1,232,925	0.48	13.4
Tamarack	1,478,512	646,674	0.44	7.7
Douglas fir	1,452,238	537,374	0.37	7.6
Hemlock	1,369,376	566,502	0.41	7.1
Western larch	1,121,347	459,643	0.41	5.8
Spruce	1,019,249	378,989	0.37	5.3
Oak	602,291	469,828	0.78	3.1
B. C. spruce	547,919	202,234	0.37	2.9
Hard pine	356,473	250,614	0.70	1.9
Chestnut	104.980	69,091	0.66	0.5
Red pine	81,979	30,923	0.38	0.4
Beech	32,637	25,331	0.78	0.2
(Rock) elm	28,973	24,627	0.85	0.2
Maple	22,449	19,995	0.89	0.1
White pine	14,165	6,446	0.46	0.1
B. C. cedar	12,609	4,035	0.32	0.1
Birch	11,018	5,293	0.48	0.1
Cypress	5,430	2,356	0.43	*
B. C. hemlock	4,019	1,246	0.31	*
Ash	106	46	0.43	*
Cherry	....	....	...	..

*Less than one-tenth of one per cent.

THE VAUGHAN TRACK INDICATOR

The Vaughan track indicator is an instrument designed to show the condition of the line and surface of track by mechanical means. The results are given in terms of the sum of all the line swings or surface jolts on any given section of track. In the operation of this instrument, motion is transmitted by car movements to two pendulums, one simple pendulum hanging vertically on ball bearings and one duplex pendulum supported horizontally by a spring bar. The horizontal pendulum is made duplex, being composed of two pendulums with different periods of oscillation, so that there can be no possibility of its period of oscillation synchronizing with the joint swing a car will sometimes have at certain speeds. Motion of the pendulums is transmitted through ball ratchets to the ball bearing counters, from which the readings are taken. The ball ratchets are sensitive and will record very small movements of the pendulums. As the riding qualities of the car will have some influence on the readings, the instrument should be always carried, if possible, in the same car at about the same speed.



Two Views of the Vaughan Track Indicator

The Vaughan track indicator is a compact instrument measuring 6 in. by 6½ by 8 in., fitted with handles. The finish is in black grain leather with all metal nickel plated. It is manufactured and sold by the M. W. Supply Company, Philadelphia, Pa.

REPAIRING FROGS AND SWITCHES ON THE KATY

By George P. White

Blacksmith Foreman, Missouri, Kansas & Texas; Parsons, Kans.

At the Parsons (Kans.) shop of the Missouri, Kansas & Texas, many frogs and switches are repaired. One of the recent developments in this work is the application of Oxweld equipment. Several switch points which were built up by the oxy-acetylene process have now been in service for six months and are apparently good for several months' additional wear. In fact, about

the same service is being secured from the repaired points as from new ones. The average cost to repair them in this manner is $1.25 as against an average cost of $2.25 for manufacturing new points. While only a few frogs have been repaired in this manner, they are also giving good service.

In addition to making repairs at Parsons, a special car is moved over the road, fully equipped to make repairs to frogs and switches out on the line. Three men accompany this outfit, making light repairs wherever necessary, where such repairs can be made without removing the frogs from the track. The movements of this car are directed by the general manager's office and the car is transferred from one division to another as the amount of work warrants, while on each division the work is outlined by the superintendent. By handling this class of repairs in this manner, it is unnecessary to carry a large number of frogs in stock, as the man in charge of this road repair gang also acts as an inspector, advising in advance when it is necessary to replace certain frogs. With this plan it is also possible to materially reduce the cost of repairs as compared with the practice of allowing the frogs to remain in the track until it is necessary to remove them and then send them into the shop for heavy repairs.

CONSTRUCTION WORK ON THE AMUR (SIBERIAN) RAILWAY

By W. A. D. Short

Siberian Russia is a country of vast expanse and distances, the extent of which is not generally appreciated in this country. The area of this part of Russia is 4,833,496 square miles, or 1,276,496 square miles larger than the United States proper, including Alaska. The leading occupation of this country is agriculture, but the country contains considerable mineral wealth, including gold, platinum, silver, iron, lead, etc.

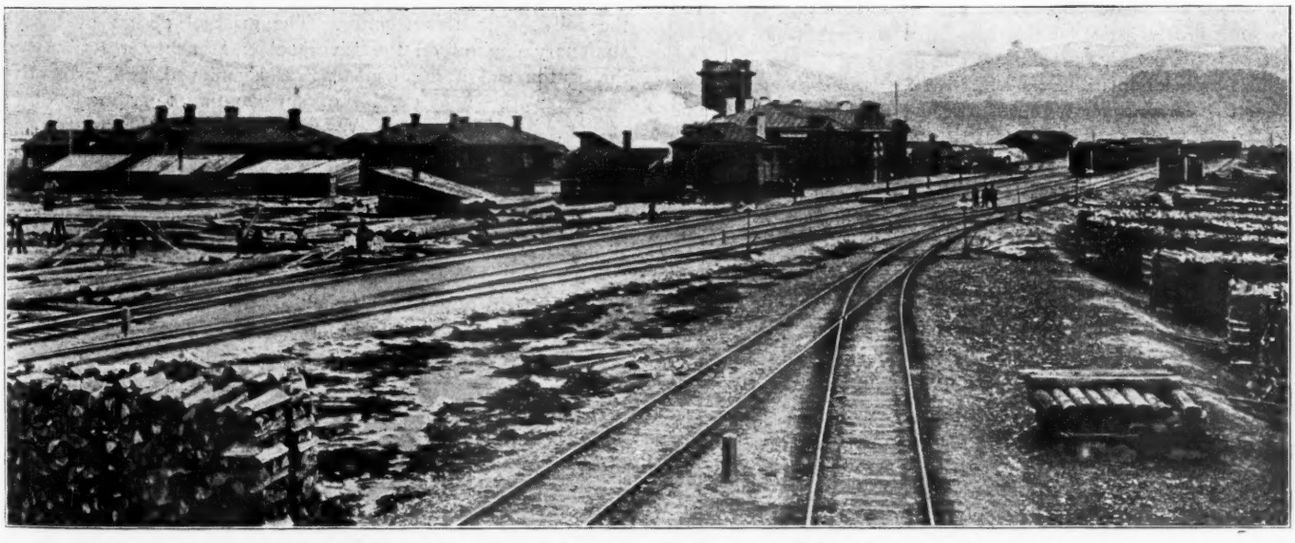
The first determined effort to open up this country and territory was made by the construction of the Trans-Siberian Railway, ground for which was broken in 1891. This road connects the city of Cheliabinsk with Vladivostock, on the Pacific Ocean, 4,000 miles away to the East. The western terminus is, in turn, 1,525 miles from Petrograd. Therefore the total length, in a continuous line, of this railway in Russian territory is 5,525 miles. In addition branches and extensions have been built, notable among which is the Amur route.

The Russian engineers learned most of their methods of construction and equipment from the Americans, as several years ago a large number of them were serving apprenticeships in American railway shops and on engineering corps. There are no automatic tie unloaders, rail unloaders, or track layers, as are now being used in this country. The ties used at first are, as a rule, half sections of trees. The trouble is not taken to hew the ties out of the trees in order to give plane surfaces on two sides. Instead they are laid with the flat surface down and are then grooved on the top to receive the "T" rail, generally weighing about 60 lb. to the yard and 24 ft. long. The angle bars have 4 holes and are similar in shape to the American type. As a suspension joint is used these bars are strengthened by additional metal in the center, extending on either side of the joint proper. The rails are laid with broken joints and 12 ties per rail length.

Laying New Track on Half-Round Ties

The grading on this line was done by hand and horse scrapers and plows, there being no steam shovel work. Construction camps and camp-cars for the laborers are unknown. The engineers sometimes have camp-cars in which they make their headquarters during the actual laying of track. But the laborers have to shift for themselves and erect tents or sleep on the ground as best they can. This is a great hardship at times, particularly as the Amur line traverses mosquito-laden forests for miles.

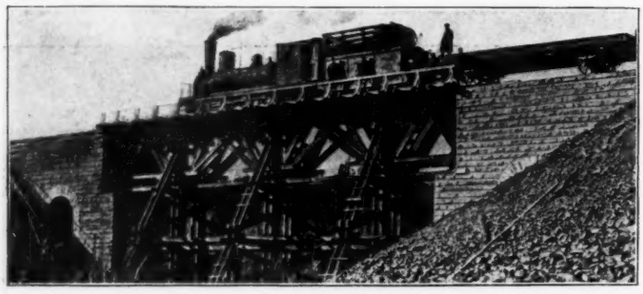
When the line is completed substantial houses are built every two miles for the track walkers and their families to reside in. Some of these houses are 300 miles from the nearest village, town, or doctor and the track walker sees no one excepting his family and a passing train for days at a time, as there are no inhabitants of these woods and the American "hobo" is unknown. On account of the vast forests and ease of procuring, wood is used as fuel by the locomotives and at important stations, as well as intermediate points, fuel depots are established which have the appearance of American stave yards.



An Important Station and Fuel Depot

In the illustration of the temporary false work for the bridge

over the Kachu river, it is interesting to note the substantial stone work construction of the permanent abutments. Run-off archways are placed under the centers of the abutments to take care of excessive floods and back wash, which take the place of the wing walls of American construction, particularly of concrete abutments. The form of construction of the bents and the bracing for the stringers and deck is different from our type, and



Falsework Over Kachu River

at the same time heavier than would be used by American engineers for temporary trestle work, but this strength of construction was probably carried out in anticipation of excessively heavy floods before the installation of the permanent span. This trestle work has now been supplanted by a deep single girder span.

CHICAGO, MILWAUKEE & ST. PAUL ROADMASTERS' ASSOCIATION

The ninth annual meeting of the Chicago, Milwaukee & St. Paul Roadmasters' Association was held at the Republican House, Milwaukee, on November 2, 3 and 4, with about 40 roadmasters present. Membership in this association is limited to the roadmasters of the Chicago, Milwaukee & St. Paul, practically all of whom are included. A three-day convention is held annually at some central point on this road, at which problems of general interest to these men are discussed.

The association has annual dues of $1 and elects officers from year to year. Committees are selected to present reports upon assigned subjects. The control of this organization is entirely in the hands of the roadmasters, the higher officers taking no active part, but attending frequently. The association is encouraged by the railroad, which provides a stenographer to report the discussion, and prints the proceedings for free distribution among the members.

In addition to providing for a free interchange of ideas among the members, all of whom are working to the same standards, this association provides an opportunity for officers in other departments to present matters of mutual interest. Thus, at the recent meeting in Milwaukee, the auditor of material accounts presented to the men several proposed forms for the keeping of time and material records, which forms were the subject of extended discussion and criticism. Likewise, the tie agent presented subjects of interest to his department. While the recommendations of this association are not binding upon the officers of the road, they are given serious consideration, the proceedings going to all maintenance and operating officers.

In addition to the free exchange of ideas, it is felt that this association is a material aid in the standardization of work over the system, clearing up many points not thoroughly understood. As all the men are using the same materials and working under the same general instructions, many topics can be discussed to advantage in such an association which could not be taken up in an organization composed of men from different roads.

Among the subjects considered at the recent meeting were the following: Are We Getting the Maximum Amount of Work Done for the Money Expended for Section Labor as Now Handled, or Can We Get Better Results by Allowing the Roadmaster to Have the Labor More Evenly Distributed Throughout the Year? What Should be the Cost Per Mile in Section Labor, of Maintaining Track in First Class Condition on Class A, B and C Divisions? What are the Defects in the Materials Furnished for Our Standard Split Switches and What Can Be Done to Remedy Such Defects? Are Our Present Standard Tool Houses Large Enough for the Requirements of Section Gangs and If Not, What Should be the Dimensions of a Section Tool House? What is the Best and Most Economical Cattle Guard to be Used on All Classes of Divisions? What is the Best Time to Apply Rail Anchors and do Extra Gangs or Section Gangs do the Best Work?

The officers elected for the following year were: President, J. C. Burke, roadmaster, Cedar Rapids, Ia.; Vice-President, J. D. Boland, roadmaster, Sanborn, Ia.; Secretary-Treasurer, W. H. Kofmehl, roadmaster, Elgin, Ill. The next meeting will be held at Seattle, Wash., to give the men an opportunity to see their Western lines.

EARLY TONNAGE STUDIES

The following paragraph, taken from a report made by Luther Hother Hage, engineer of the West Feliciana Railroad (now a part of the Illinois Central system), dated May 24, 1836, is of interest in these days of low grades and heavy tonnage trains as indicating not only the limitations of 80 years ago, but the lead which the United States assumed in freight transportation in those early days and the importance attached to tonnage at that time:

"Eleven years ago the best locomotive engines manufactured in England had a power equal to convey 40 tons at the rate of 6 miles an hour. It was then admitted that these engines were susceptible of great improvements, but the idea was divided that 'any possible improvement' could enable them to proceed at double the velocity named. Four years after this the average rate of traveling was 15 miles an hour on the Liverpool & Manchester Railway. Thrice the velocity first named has been attained 5 years ago, and is now daily performed on some of the railways in this country. The original design of having stationary engines on the Liverpool & Manchester Railway at the Sutton and Rainhill planes was abandoned, and locomotive engines were found capable of surmounting their grade of 55 ft. per mile. The progressive improvements in the construction of these engines in our own country have attained to such a degree of perfection that they are under all circumstances capable of generating an adequate power of steam to overcome the adhesion of the wheels to the surface of the rails, while those of English construction are unable to keep up a sufficient supply. On the Columbia Railroad in Pennsylvania, where an inclination of 45 ft. per mile has been introduced, the 'Canal Commissioners' have reported that 'the majority of the American engines in their ordinary trips draw a gross load of 75 tons. One of them has drawn 100 tons and several others from 80 to 90 tons over the highest grade on the road.' More was done in December, 1834, on the Baltimore & Ohio Railroad, where a locomotive engine passed over the planes at Parr's Ridge, ascending 2/3 mile at the average rise of 264 ft. per mile, with two cars full of passengers, making with the tender, 11 tons exclusive of its own weight of 7½ tons. Applying the known power of engines of the same construction as those intended for this road, namely, that they have drawn 75 tons up an inclination of 45 ft. rise in a mile, such engines would be capable of ascending the steepest grade upon this road with a gross weight of 48 tons. This would enable such an engine to take more than 9 loaded cars from the Mississippi river toward Woodville. In the opposite direction I am unable to make any calculations of the quantity of burden an engine will move; I presume, however, that 80 tons gross or more than 17 loaded cars may be brought in a train from the interior to the Mississippi river by one locomotive, as the steepest grade of the road in this direction has an ascent of but 30.4 ft. to a mile."

General News Department

In press despatches of November 13 it is announced that the railways throughout Mexico will pass from military to civil control December 6 under a decree of General Carranza, head of the de facto government.

The Chicago, Milwaukee & St. Paul announces the opening to traffic of the Puget Sound & Willapa Harbor Railway, a branch 66 miles long, running from Willapa Harbor, Wash., to Maytown on the Gray's Harbor branch.

According to the Canal Record, excavation from the Gaillard Cut, on account of the slides in the Panama Canal, during October amounted to 1,079,663 cu. yd., compared with 1,052,586 cu. yd. in September, 991,879 cu. yd. in August and 692,109 cu. yd. in July. In October 872,952 cu. yd. were taken from the base of the Culebra slides.

During September the Southern Railway disbursed for labor, material, supplies and other purposes $4,129,787, of which $3,660,518, or 88.64 per cent, was paid to the individuals and industries in the South. This amount represents more than 90 per cent of the moneys paid to the company for transportation by people situated on the lines.

The Chicago switchmen who, as reported last week, have filed demands for increases in pay, have asked the roads to defer action looking to the fixing of a date for a conference. It is understood that this request is due to the fact that the switchmen have been called off by the officers of their brotherhood because of the feeling that they might jeopardize the campaign for an eight-hour day.

The President of the United States has appointed a "Board of First-Aid Standardization" with a view to making available for possible military use the first-aid activities of various industries in time of peace. Dr. S. C. Plummer, of Chicago, chief surgeon of the Chicago, Rock Island & Pacific, and representing the American Association of Railway Surgeons, is a member of the board. The purpose of the board is to standardize first-aid packages and equipment, the means of transporting wounded persons and first-aid instruction.

The Baltimore & Ohio has issued for its employees a treatise on first aid to the injured prepared by Dr. Joseph F. Tearney, chief medical examiner of the road. Discussing the effect of alcoholic liquors given in connection with sickness or accident, Dr. Tearney says: "Whiskey, even in small teaspoonful doses, increases the tendency to bleeding. When given in the somewhat larger quantity, known as the ordinary 'drink,' the first effect of stimulation is followed by a corresponding depression, so that, when the surgeon arrives, he will have to lose valuable time in combating this depression, in addition to that caused by the shock of the accident. . . . If the sympathetic friend with the bottle tries to deaden pain with whiskey, he may produce intoxication and it is difficult to put a half-drunken man under an anaesthetic. It may be asked why the surgeon sometimes gives whiskey; the answer is that he knows how much to use and when not to use any. . . . Make it your iron-bound rule to allow the patient to have no whiskey or other alcoholic liquor."

As announced in a previous issue, the first annual track and field meet of the Missouri, Kansas & Texas Athletic Association was held at Denison, Tex., on November 6. The association was organized largely for the purpose of bringing the employees together and to promote good fellowship, and nearly 4,000 employees were present. Those from out of town were brought to Denison in six special trains, and every district on the system was represented in the contest, as well as several of the officers, including W. A. Webb, chief operating officer, and H. F. Anderson, general superintendent. A large number of other officers was present. The C. E. Schaff trophy, donated by Receiver Schaff, which is to be contested for annually, was awarded to the Denison district, and was presented by Vice-President Whitehead in the absence of Mr. Schaff. Gold, silver and bronze medals were awarded to the winners of the individual events and were presented by General Manager W. E. Williams. The officers report that the spirit with which the employees have entered into the activities of the association has been very pleasing and indicates that the organization will be very helpful in many respects. The city of Denison declared a holiday for the occasion and many features of entertainment were arranged for the visitors.

Over three-quarters of the new men employed in the Boston freight houses, following the strike of October 21, are reported as having proved satisfactory for permanent employment; and the reports of "settlements" which have appeared in the newspapers within the last week evidently have no serious meaning except that the roads, in accordance with the attitude which they announced at the outset, have taken back strikers, as individuals, insofar as there was room for them. The marked increase in the volume of freight during the past month also has ameliorated the condition of the strikers somewhat. It is said that some of the men who struck were affiliated with the American Federation of Labor and some with the Knights of Labor; but the chief officers of these organizations were not consulted. The mayor of the city and the governor of the state seem to have been the only persons of prominence who espoused the cause of the strikers. The Boston News Bureau says that the misled members of the freight handlers' unions have had to lose not only several weeks' wages while they have been idle, but also, even when taken back, their record rating; and continues: "A halt has apparently been called upon the arrogance of union labor leaders in disregarding the public's convenience, pecuniary interest and general welfare. The Boston roads, in 'standing up in their boots' in this situation, have set an example that everybody should commend. * * * As often happens in such strike episodes, the hardships involved have borne particularly on the older members of the union, who had little appetite for striking but were overruled in the union councils by the more vociferous and impetuous younger members and their leaders."

"A Corporation with a Soul"

Citizens of Ardmore, Okla., have erected in a prominent location a billboard bearing the words "Great is the Santa Fe. One Corporation with a Soul." This was done as a mark of appreciation for the promptness with which President Ripley, of the Santa Fe, agreed to settle for all damages resulting from the recent explosion of a tank car on the company's tracks at Ardmore in which many people were killed and a large amount of property was destroyed. Without admitting its liability for the accident, the company suggested the appointment of a board of arbitrators from the citizens of the city to pass upon the amount of settlement in each case.

Reduction in Loss and Damage Claims on the North Western

The Chicago & North Western, which during the last year and a half has been conducting a special campaign for the reduction of loss and damage claims, in the fiscal year ended June 30, 1915, showed a decrease of $238,860 in its payments for loss or damage to freight, a reduction of about 20 per cent, whereas the freight revenue decreased only 3.8 per cent. Largely as the result of the campaign, 40,000 less claims were presented than during the year before. H. C. Howe, freight claim agent, has just issued a circular to all agents of the company and other employees, announcing November 16 and November 24 as special claim prevention days, with the idea that special efforts made on these days to avoid the causes for loss and damage to freight will tend to promote more careful habits on other days. The circular says that "every day is claim prevention day, but the above dates are to be extraordinary," and an especial effort is to be made to show a still greater improvement during the coming year. This campaign is handled by the freight claim agent, who has five inspectors traveling all of the time inspecting

the loading and unloading of freight, and instructing employees in proper methods. Special effort is also made to trace the over, short and damage reports to ascertain causes and endeavor to eliminate damage in future by bringing the matter to the attention of the employees at fault, without discipline. A pamphlet has been distributed among the agents of the road, in which are a large number of illustrations showing improper methods of loading and handling freight, and their results, together with the proper methods.

Applicable also on the X. Y. & Z.

General Manager Robert S. Parsons of the Erie Lines West has issued to enginemen a circular which, according to the *Cleveland Leader,* includes the following:

"If you were a passenger seated at a car window, or sleeping in a berth, you would not like to have a locomotive whistle blown just opposite you, giving you a severe attack of the 'jumps.'

"If you were a passenger you would not like to have the train come to a stop with a jolt rough enough to break the articles in your traveling bag and give you a general shaking up.

"Yet these annoyances occur every day, and many times a day, on the Erie Railroad—all because you do not realize the situation in which the passengers are placed. There is no rule or regulation that can stop these practices. It rests entirely upon your good nature and thoughtfulness. Will you strive to make an improvement?"

Texas Repair Shed Law

The Supreme Court of Texas has rendered a decision holding constitutional the law of that state which requires the maintenance by railroads of suitable sheds for employees when repairing cars. The case was that of the state against the International & Great Northern, on appeal from Harris county. The lower court held that the law was unconstitutional, but this decision is now reversed. The strict enforcement of the law will call for the construction of many repair sheds.

The lower courts held the law unconstitutional because vague and meaningless; but Associate Justice Yantis cites similar language in statutes that have stood the test of constitutionality before the United States Supreme Court.

The car shed law requires the erection and maintenance of a building or shed by every person, corporation, or receiver engaged in constructing or repairing railroad cars, and provides penalties of from $50 to $100 for each 10 days of its violation. The law has several exemptions by the terms of which each corporation, etc., would be absolved from its penalties. Among these exemptions is the provision that the act shall not apply at "points where it is necessary to make light repairs only." A general demurrer was sustained to the state's petition upon the ground that the act was too indefinite in its terms to enforcible, the trial court holding that the term "light repair" is a relative term and wholly unintelligible.

The Supreme Court holds that because the act is penal in its nature it should be strictly construed. It notes in the opinion, however, that the term "light repairs" is used in a provision exempting from suit and not in a portion of the act which penalizes an infraction of its provisions. . . . "We think the term 'light repairs' makes plain the intent of the legislators, and that the industries affected by the legislation will not suffer from a failure to understand its meaning; and that the courts and juries will find no difficulty in determining from the facts in each case whether the repairs were 'light' or otherwise."

Mail Pay on Middle West Roads

The Postmaster General announces the completion of the mail pay adjustments for the next four years on all railroads in the Third Contract Section. The third section handles the heaviest bulk of mail of all the sections. It embraces Ohio, Indiana, Illinois, Michigan, Minnesota, Wisconsin, Iowa and Missouri. The adjustments are based on a complete weighing during 105 days, February 18 to June 2.

The statement says: "The pay of all the roads in this territory, for four years, is fixed at $20,073,484.36 a year. The weighing showed that an average of 2,862 tons of mail was being carried each day in over 4,000 trains.

"The eager competition among the railroads to share in the mail pay is shown by the fact that they will reecive annually more than $200,000 less than the maximum allowed by law, because certain lines between common points accept a lower rate of pay in order to retain the carriage of through mails. In such case the Department gives the companies operating the more expensive [longer] lines the opportunity of meeting the cheapest rate and retain the mails. This the railroads are always willing to do.

"A conspicuous instance of this is found between Chicago and Minneapolis. Between these cities the Chicago & North-Western is the cheaper on account of shorter distance and land-grant deductions. The Chicago, Milwaukee & St. Paul, which has carried the bulk of the mails for many years, accepts the lower rate of the North-Western on all through mails, and thereby its pay on this one route is reduced $112,000 yearly. The New York Central carried competitive mails between New York and Chicago at the lower short-line rate, with a reduction of $95,000 a year in its compensation.

"Postal officials think the alacrity with which the railroads agree to these reductions and their efforts before each weighing to secure additional mails by offering expedited or new train service as inducement are good evidence of the unjustness of the often-repeated assertion that the railroads are handling the mails at a loss. . . . No less than 793 train weighers, 321 station weighers, 59 verifiers at railway mail service division headquarters and 58 tabulators and computors in the Department at Washington were employed in the weighing this year, at a cost of $381,948. This is more than $97,000 less than the cost of the last weighing in the third section, an economy effected through the adoption of improved methods, supervision direct from the Department and tabulation of results in Washington instead of in the field, as formerly. The saving during the last four years has been over $280,000."

The New Haven Trial

Charles S. Mellen was characterized as an adverse witness while testifying Thursday, November 11 for the government in the criminal suit against New Haven directors for violating the Sherman Law. The government attorney, R. L. Batts, expressed the opinion that Mr. Mellen "has shown a willingness to answer questions concerning every fact which we have proved by other testimony, but he has shown a different disposition where the defence of his own conduct is involved. I think I should have a certain latitude in asking him questions as if he were in a measure an adverse witness."

The remark was made in connection with Mr. Mellen's testimony concerning the New Haven's dealings with competing lines, and particularly with the Enterprise Line. The government brought out that the United States Transportation company was established to meet the competition of this steamship company, and that its affairs were wound up and its properties taken over by another New Haven company, immediately after the Enterprise Line became bankrupt and went out of business. The government attorney made a strong effort to show that the New Haven tried to conceal its activities in this and other cases.

Considerable attention was paid on Thursday and Friday to the New Haven's relations with Charles W. Morse. In 1907 Morse controlling extensive water traffic, offered the New Haven $20,000,000 for its boat lines, or $14,000,000 more than their cost to the railroad. Mr. Mellen, it appears, argued strongly in favor of accepting the offer but the board of directors was strongly against so doing, being influenced largely by a statement of ex-president Roosevelt's to the effect that he was fearful of the success of Morse's proposed steamship monopoly and preferred the present situation. The New Haven took steps to protect itself against Morse and in that connection secured an interest in the Merchants & Miners Transportation Company and the Windsor Line which had been amalgamated with it. Mr. Mellen in 1912 proposed to acquire the minority stock and secure majority control. He planned by this means to extend the New Haven's steamship lines to include a service from Boston to Galveston, and later from Boston via the Panama Canal to Pacific coast points. The scheme was to buy the minority stock of the Merchants & Miners Transportation company and to have that company inaugurate the additional service. He expected that the New Haven, for some time, would have a loss on this business, and did not want minority holders to suffer this loss. These ambitious plans to extend New Haven's steamship monopoly were suggested and

stimulated by directors of the port of Boston and other Boston interests who wanted cotton brought direct from Galveston to Boston by steamer; but they were not carried out because of the passage of the Panama Canal Act, divorcing water and railway lines.

The testimony then turned to the relations with the Metropolitan Line. The latter in 1905 operated freight boats on the outside route between New York and Boston. It later established a passenger service, using the Harvard and Yale. Thereupon the New Haven put in service in competition the freight steamers Old Colony, Bunker Hill and Massachusetts, these later being converted into passenger boats when the New Haven acquired control of the Metropolitan Line and transferred the Harvard and Yale to the Pacific coast. On Monday this was gone over in more detail, but so confused did matters become that Judge Hunt finally had to call a halt and ask the counsel to submit a written statement of the Metropolitan situation.

On Tuesday, November 15, Mr. Mellen was questioned about the acquisition of trolley lines. Judge Hunt ruled that the government could go ahead in its proof that the 65 trolley lines acquired by the New Haven, were taken over for the purpose of interstate commerce.

On Wednesday, H. W. Goodall, of San Francisco, testified concerning the Pacific Navigation Company, which leased from the Pacific Company, a subsidiary of the Metropolitan Steamship Company, of New Jersey, the steamers Harvard and Yale. Mr. Mellen was again on the stand in the afternoon.

June Mechanical Conventions

The meeting of the executive committee of the Master Car Builders' Association, the American Railway Master Mechanics' Association and the Railway Supply Manufacturers' Association was held in Chicago on November 15. It was decided that the next annual convention of the Master Car Builders' and the Master Mechanics' Associations would be held at Atlantic City, starting June 14, the Master Car Builders' convention being held first and the Master Mechanics' convention the following Monday. The city of Chicago would undoubtedly have been chosen as the convention meeting place had the Municipal Pier been ready for occupancy at that time. It is believed that in future years the June conventions will be held at that place.

Western Railway Club

At the November meeting of the Western Railway Club, which was held in the Fort Dearborn hotel, Chicago, November 16, a paper was presented on "The Prevention of Loss and Damage Freight Claims," by G. E. Whitelam, superintendent freight loss and damage claims, St. Louis & San Francisco Railroad, Springfield, Mo. Mr. Whitelam outlined the system followed by the Frisco for the prevention of loss and damage claims, giving a brief history of the organization from its inception, and showing the beneficial results accruing from the claim prevention campaign. A complete description of the work the Frisco has been doing along these lines was published in a series of articles in the *Railway Age Gazette* last spring, the first article appearing in the issue of April 9, 1915, page 779, the second article appearing April 16, 1915, page 817, and the third article appearing April 23, 1915, page 891.

Plans for March Convention Exhibits

A meeting of the board of directors of the National Railway Appliances Association was held at Chicago on November 12, to discuss plans for the annual exhibit of the association in connection with the convention of the American Railway Engineering Association, which is to be held on March 20 to 23, inclusive. C. W. Kelly, of the Kelly-Derby Company, Chicago, secretary, treasurer and director of the exhibits for the association, reported that over 80 per cent of the exhibit space has already been signed for. The exhibit will occupy the entire main floor of the Coliseum and Annex, a total of 36,600 sq. ft. of exhibit space, and the floor plan has been changed so that approximately 1,000 sq. ft. will be added to the available exhibit space as compared with previous years. A number of important improvements has also been decided upon for the arrangement of the exhibit space, especially in the Annex, and in the decoration and lighting system. In the Coliseum 27,026 sq. ft. of space has been allotted and in the Annex 2,885 sq. ft., leaving 3,625 sq. ft. in the Coliseum and 3,112 sq. ft. in the Annex unallotted.

MEETINGS AND CONVENTIONS

The following list gives names of secretaries, date of next or regular meetings, and places of meeting of those associations which will meet during the next three months. The full list of meetings and conventions is published only in the first issue of the Railway Age Gazette for each month.

AMERICAN ASSOCIATION OF DEMURRAGE OFFICERS.—F. A. Pontious, 455 Grand Central Station, Chicago. Next meeting, January, 1916, Atlanta, Ga.

AMERICAN RAILWAY ASSOCIATION.—W. F. Allen, 75 Church St., New York. Next meeting, November 17, 1915, The Blackstone, Chicago.

AMERICAN SOCIETY OF CIVIL ENGINEERS.—Chas. Warren Hunt, 220 W. 57th St., New York. Regular meetings, 1st and 3rd Wednesday in month, except July and August, 220 W. 57th St., New York.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 39th St., New York. Annual meeting, December 7-10, 1915, New York.

AMERICAN WOOD PRESERVERS' ASSOCIATION.—F. J. Angier, Supt. Timber Preservation, B. & O., Mt. Royal Sta., Baltimore, Md. Next convention, January 18-20, 1916, Chicago.

ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS.—G. P. Conard, 75 Church St., New York. Next meeting, December 14-15, 1915, St. Louis, Mo.

CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk, P. O. Box 7, St. Lambert (near Montreal), Que. Regular meetings, 2d Tuesday in month, except June, July and August, Windsor Hotel, Montreal, Que.

CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, 176 Mansfield St., Montreal, Que. Regular meetings, 1st Thursday in October, November, December, February, March and April. Annual meeting, January, Montreal.

CAR FOREMEN'S ASSOCIATION OF CHICAGO.—Aaron Kline, 841 Lawlor Ave., Chicago. Regular meetings, 2d Monday in month, except June, July and August, Hotel La Salle, Chicago.

CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York. Regular meetings, 2d Friday in January, May, September and November. Annual meeting, 2d Thursday in March, Hotel Statler, Buffalo, N. Y.

ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA.—Elmer K. Hiles, 2511 Oliver Bldg., Pittsburgh, Pa. Regular meetings, 1st and 3d Tuesday, Pittsburgh, Pa.

GENERAL SUPERINTENDENT'S ASSOCIATION OF CHICAGO.—A. M. Hunter, 321 Grand Central Station, Chicago. Regular meetings, Wednesday preceding 3d Thursday in month, Room 1856, Transportation Bldg., Chicago.

NEW ENGLAND RAILROAD CLUB.—W. E. Cade, Jr., 683 Atlantic Ave., Boston, Mass. Regular meetings, 2d Tuesday in month, except June, July, August and September, Boston.

NEW YORK RAILROAD CLUB.—Harry D. Vought, 95 Liberty St., New York. Regular meetings, 3d Friday in month, except June, July and August, 29 W. 39th St., New York.

NIAGARA FRONTIER CAR MEN'S ASSOCIATION.—E. N. Frankenberger, 623 Brisbane Bldg., Buffalo, N. Y. Meetings, 3d Wednesday in month, New York Telephone Bldg., Buffalo, N. Y.

PEORIA ASSOCIATION OF RAILROAD OFFICERS.—M. W. Rotchford, 410 Masonic Temple Bldg., Peoria, Ill. Regular meetings, 3d Thursday in month, Jefferson Hotel, Peoria.

RAILROAD CLUB OF KANSAS CITY.—Claude Manlove, 1008 Walnut St., Kansas City, Mo. Regular meetings, 3d Saturday in month, Kansas City.

RAILROAD MEN'S IMPROVEMENT SOCIETY.—J. B. Curran, Erie R. R., 50 Church St., New York. Meetings, alternate Thursdays, October to May, Assembly Rooms of Trunk Line Association, 143 Liberty St., New York.

RAILWAY BUSINESS ASSOCIATION.—Frank W. Noxon, 30 Church St., New York. Annual meeting, December, 1915, Waldorf-Astoria Hotel, New York.

RAILWAY CLUB OF PITTSBURGH.—J. B. Anderson, Room 207, P. R. R. Sta., Pittsburgh, Pa. Regular meetings, 4th Friday in month, except June, July and August, Monongahela House, Pittsburgh.

RICHMOND RAILROAD CLUB.—F. O. Robinson, C. & O., Richmond, Va. Regular meetings, 2d Monday in month, except June, July and August.

ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo. Regular meetings, 2d Friday in month, except June, July and August, St. Louis.

SALT LAKE TRANSPORTATION CLUB.—R. E. Rowland, David Keith, Bldg., Salt Lake City, Utah. Regular meetings, 1st Saturday of each month, Salt Lake City.

SOUTHERN & SOUTHWESTERN RAILWAY CLUB.—A. J. Merrill, Grant Bldg., Atlanta, Ga. Regular meetings, 3d Thursday, January, March, May, July, September, November, 10 A. M., Piedmont Hotel, Atlanta.

TOLEDO TRANSPORTATION CLUB.—Harry S. Fox, Toledo, Ohio. Regular meetings, 1st Saturday in month, Boody House, Toledo.

TRAFFIC CLUB OF CHICAGO.—W. H. Wharton, La Salle Hotel, Chicago.

TRAFFIC CLUB OF NEWARK.—John J. Kautzmann, P. O. Box 238, Newark, N. J. Regular meetings, 1st Monday in month, except July and August, The Washington, 559 Broad St., Newark.

TRAFFIC CLUB OF NEW YORK.—C. A. Swope, 291 Broadway, New York. Regular meetings, last Tuesday in month, except June, July and August, Waldorf-Astoria Hotel, New York.

TRAFFIC CLUB OF PITTSBURGH.—D. L. Wells, Gen'l Agt., Erie, R. R., 1924 Oliver Bldg., Pittsburgh, Pa. Meetings, bi-monthly, Pittsburgh.

TRAFFIC CLUB OF ST. LOUIS.—A. F. Versen, Mercantile Library Bldg., St. Louis, Mo. Annual meeting in November. Noonday meetings October to May.

TRANSPORTATION CLUB OF DETROIT.—W. R. Hurley, Superintendent's office, N. Y. C. R. R., Detroit, Mich. Meetings monthly, Normandie Hotel, Detroit.

UTAH SOCIETY OF ENGINEERS.—Frank W. Moore, 1111 Newhouse Bldg., Salt Lake City, Utah. Regular meetings, 3d Friday in month, except July and August, Salt Lake City.

WESTERN CANADA RAILWAY CLUB.—L. Kon, Immigration Agent, Grand Trunk Pacific, Winnipeg, Man. Regular meetings, 2d Monday, except June, July and August, Winnipeg.

WESTERN RAILWAY CLUB.—J. W. Taylor, 1112 Karpen Building, Chicago. Regular meetings, 3d Tuesday in month, except June, July and August, Karpen Bldg., Chicago.

WESTERN SOCIETY OF ENGINEERS.—E. M. Layfield, 1735 Monadnock Block, Chicago. Regular meetings, 1st Monday in month, except January, July and August, Chicago. Extra meetings, except in July and August, generally on other Monday evenings. Annual meeting, 1st Wednesday after 1st Thursday in January, Chicago.

REVENUES AND EXPENSES OF RAILWAYS

MONTH OF SEPTEMBER, 1915

Name of Road.	Average mileage operated during period.	Operating revenues			Operating expenses							Net from railway operation.	Railway tax accruals.	Operating income (or loss).	Increase (or decr.) comp. with last year.
		Freight.	Passenger	Total (inc. misc.)	Maintenance of Way and structures.	Maintenance of Equipment.	Traffic.	Transportation.	Miscellaneous.	General.	Total.				
Alabama & Vicksburg	143	$88,618	$34,003	$132,323	$15,704	$32,943	$3,488	$45,756	$2,114	$5,630	$105,636	$27,687	$7,850	$19,837	$6,899
Alabama Great Southern	309	293,872	85,748	408,058	45,355	92,928	11,749	126,172	3,774	8,757	288,705	119,353	15,171	104,183	50,287
Ann Arbor	294	130,624	51,578	196,467	26,082	35,811	5,304	66,993	645	8,520	143,355	53,112	12,800	40,302	—12,109
Atlanta, Birmingham & Atlantic	638	202,282	45,717	265,670	42,169	45,109	12,065	95,961	21	10,259	205,584	60,085	13,100	46,952	53,279
Atlantic & St. Lawrence	167	75,172	30,094	117,146	22,160	15,424	3,392	48,762	.....	4,271	94,009	23,137	11,505	11,628	14,135
Atlantic City	170	74,436	164,907	252,095	37,446	21,197	3,299	111,991	97	1,082	175,112	76,983	10,000	66,957	7,390
Baltimore & Ohio	4,535	7,535,474	1,402,909	9,617,819	1,122,287	2,025,353	162,801	2,882,995	51,645	180,454	6,424,145	3,143,674	284,150	2,908,610	544,685
Baltimore & Ohio Chicago Terminal	79	.....	599	142,310	17,386	16,450	760	55,802	1,824	5,503	94,007	48,303	17,654	30,649	6,183
Belt Ry. Co. of Chicago	26	.....	.....	225,281	19,740	27,494	510	81,303	.....	4,468	133,516	91,765	10,758	81,007	—52,990
Boston & Maine	2,302	2,393,370	1,551,525	4,329,998	498,591	530,562	36,492	1,668,383	17,346	92,225	2,843,599	1,486,399	157,108	1,329,291	481,243
Canadian Pacific Lines in Maine	233	45,211	17,137	69,453	25,342	9,832	4,879	30,511	.....	3,482	74,046	—4,593	12,000	—16,593	—8,295
Carolina, Clinchfield & Ohio	283	198,997	18,075	221,232	23,374	26,665	8,044	38,007	.....	9,164	103,975	117257	14,250	102,979	9,474
Carolina, Clinchfield & Ohio of S. C.	18	11,026	1,243	12,581	1,385	83	1,788	2,269	.....	740	6,169	6,412	750	5,662	1,034
Central New England	304	318,899	42,063	376,270	59,691	34,448	1,216	92,857	.....	4,610	192,650	183,620	12,800	170,816	63,315
Central Vermont	411	223,677	98,711	359,172	53,806	58,244	9,410	133,797	4,086	6,637	265,980	93,193	15,590	77,602	15,294
Chicago & Eastern Illinois	1,282	1,077,124	265,478	1,449,766	223,383	343,347	21,741	455,163	7,311	35,966	1,083,640	366,126	53,600	311,935	32,068
Chicago & Erie	270	594,191	56,041	697,120	72,179	72,342	16,460	228,253	1,508	12,972	402,063	295,057	20,500	274,557	—265,712
Chicago, Milwaukee & St. Paul	10,076	6,470,333	1,848,575	9,261,439	930,825	1,350,167	163,144	3,104,869	66,809	148,875	5,438,472	3,822,967	455,040	3,364,689	158,916
Chicago, Rock Island & Pacific	7,654	4,054,056	1,782,196	6,325,106	1,049,137	1,105,206	137,895	2,201,245	38,108	157,978	4,687,403	1,637,703	293,835	1,343,228	—362,180
Cincinnati, New Orleans & Tex. Pac.	337	628,556	143,427	822,328	83,919	213,303	22,374	237,583	3,899	18,640	579,718	242,609	31,000	211,573	108,230
Colorado Midland	338	131,540	24,665	165,735	26,002	30,489	6,870	65,017	1,189	5,784	135,151	30,585	10,000	20,585	—20,279
Colorado & Southern	1,089	535,119	139,923	730,572	108,591	136,534	9,201	199,291	5,004	22,566	481,186	249,387	35,000	214,347	40,022
Cripple Creek & Colorado Springs	87	94,359	22,286	118,527	17,209	11,810	4,093	30,202	.....	3,112	66,426	52,100	6,863	45,238	.....
Denver & Rio Grande	2,577	1,617,139	650,762	2,443,638	279,284	337,268	42,618	589,161	49,576	47,660	1,345,566	1,098,072	90,000	1,007,748	290,434
Detroit & Toledo Shore Line	81	114,474	.....	115,185	11,954	6756	1,544	30,188	.....	2,696	53,138	62,047	5,575	56,472	241
Detroit, Grand Haven & Milwaukee	191	165,000	56,000	257,301	25,748	24,549	5,395	101,403	747	4,157	161,963	95,338	3,770	91,487	80,913
Detroit, Toledo & Ironton	441	163,359	16,210	191,701	21,030	21,166	4,035	70,793	.....	5,925	122,950	68,751	5,500	63,251	11,828
Duluth, Winnipeg & Pacific	185	83,085	16,036	104,470	13,719	11,725	1,532	35,908	105	5,532	68,520	35,951	5,224	30,727	24,924
Erie	1,988	4,245,277	832,035	5,556,546	480,337	806,977	86,016	1,745,548	33,935	108,722	3,237,817	2,318,728	168,654	2,147,058	1,233,497
Fort Worth & Denver City	454	322,928	141,925	488,463	57,624	80,675	6,162	133,042	2,929	14,808	295,240	193,223	18,748	174,475	41,214
Galveston, Harrisburg & San Antonio	1,351	790,199	281,617	1,124,861	134,591	137,499	27,269	366,549	9,981	30,790	704,160	420,701	46,269	374,202	36,937
Georgia	307	202,987	59,278	278,947	18,111	43,058	12,744	98,666	20	6,730	179,329	99,617	53,225	46,392	14,267
Grand Trunk Western	347	462,000	150,000	669,916	56,781	107,356	14,981	233,962	5,793	11,894	430,766	239,150	18,870	220,276	148,379
Great Northern	8,102	5,885,370	1,310,302	7,862,037	566,813	736,460	93,793	1,821,067	75,296	111,637	3,374,421	4,487,616	448,018	4,039,537	—298,655
Gulf, Colorado & Santa Fe	1,938	1,011,535	269,978	1,344,235	333,344	212,203	29,685	462,484	.....	33,175	1,068,814	175,421	58,203	216,934	—162,996
Hocking Valley	351	547,907	81,324	679,716	68,723	117,228	8,050	177,252	.....	13,458	384,712	295,004	37,400	257,604	2,631
Houston, East & West Texas	191	78,302	25,322	110,879	20,884	17,421	1,927	36,363	618	3,133	79,334	31,546	5,810	25,671	49,278
Houston & Texas Central	895	448,083	125,943	615,411	76,525	90,647	16,131	180,424	5,820	19,213	388,130	227,281	29,883	197,215	151,878
Kansas City, Mexico & Orient	737	152,732	36,904	201,269	56,956	45,290	8,794	86,783	.....	11,252	209,075	—7,806	10,000	—17,806	—65,945
Lake Erie & Western	900	515,799	69,639	616,508	73,803	117,487	11,298	178,774	.....	11,544	392,906	223,602	24,400	199,199	56,827
Lehigh & Hudson River	97	143,652	10,112	160,884	20,126	21,254	1,457	48,772	.....	3,785	95,395	65,489	4,200	61,289	11,364
Lehigh & New England	296	268,775	838	283,590	41,847	28,297	2,067	64,024	.....	4,593	140,829	142,761	6,200	136,561	19,371
Louisiana Ry. & Navigation Co.	351	157,640	29,734	204,153	29,846	29,612	6,361	58,923	.....	4,713	129,455	74,698	9,500	65,195	40,778
Louisiana Western	208	122,289	54,887	189,494	22,692	37,875	6,890	50,424	1,677	5,995	125,539	63,955	10,025	53,911	—32,394
Louisville & Nashville	5,038	3,588,608	950,476	4,862,436	690,607	872,299	109,193	1,386,673	23,932	102,222	3,182,701	1,679,734	191,277	1,487,808	522,167
Louisville, Henderson & St. Louis	200	88,465	40,178	135,553	28,163	20,047	5,005	36,824	.....	3,232	93,271	42,282	3,800	38,481	6,016
Minneapolis & St. Louis	1,646	772,599	199,375	1,023,357	120,209	124,284	18,528	315,159	.....	23,152	601,331	422,026	30,059	391,674	77,125
Minn., St. Paul & S. S. Marie	4,229	2,291,969	582,343	3,100,086	310,798	324,517	57,422	854,091	18,196	57,514	1,619,434	1,480,652	158,235	1,322,417	138,615
Missouri, Kansas & Texas System	3,865	1,709,633	721,701	2,626,899	446,344	407,527	52,178	886,004	15,253	99,822	1,901,567	725,332	140,577	583,367	—35,575
Missouri, Oklahoma & Gulf of Texas	125	12,583	297	12,997	3,136	2,255	1,769	9,734	.....	1,278	18,173	—5,176	141	—5,317	—2,241
Missouri Pacific	3,931	2,009,425	477,401	271,413	420,792	548,068	62,436	897,202	11,218	66,712	2,005,503	706,910	99,418	602,690	—278,432
Mobile & Ohio	1,122	811,814	100,455	963,988	108,399	216,928	32,057	332,285	2,436	30,666	722,771	241,218	28,386	212,641	121,736
Monongahela	75	132,339	2,102	136,610	12,220	7.480	626	27,743	.....	3,125	51,194	85,417	2,500	82,917	.....
Morgan's La. & Tex. R. R. & S. S. Co.	405	237,449	81,359	359,106	50,595	61,636	11,552	124,688	2,113	11,509	262,093	97,013	20,881	75,806	59,110
Nevada Northern	165	125,310	11,290	140,724	19,288	11,783	612	25,169	88	4,282	61,222	79,502	8,505	70,997	48,938
New Orleans Great Northern. { Freight	277														
New Orleans Great Northern. { Passenger	283	106,231	24,144	143,041	18,991	24,747	2,917	41,804	184	5,900	94,543	48,448	3,892	44,595	—721
New Orleans, Texas & Mexico	286	100,987	19,739	128,834	13,115	19,885	3,419	44,873	.....	9,968	91,260	37,575	1,501	36,073	20,211
New York Central Railroad	5,979	10,107,181	4,418,887	16,923,031	1,784,353	2,714,325	232,567	4,759,107	230,988	367,266	10,088,605	6,834,426	771,743	6,061,874	.....
New York, New Haven & Hartford	2,005	2,942,742	2,667,485	6,313,161	717,334	914,505	38,923	2,063,798	54,432	128,991	3,915,736	2,397,425	196,000	2,200,889	421,281
New York, Susquehanna & Western	140	212,652	48,480	290,730	27,141	33,333	1,648	133,515	.....	5,644	201,274	89,455	13,208	76,247	2,297
Norfolk & Western	2,042	4,105,168	521,044	4,789,627	675,978	784,734	57,582	1,147,536	8,884	68,712	2,725,127	2,064,500	168,000	1,896,429	550,083
Norfolk Southern	908	241,702	87,881	350,827	47,657	51,725	7,781	119,239	320	17,883	244,606	106,221	12,251	93,970	24,403
Northwestern Pacific	507	164,983	206,046	416,063	57,216	40,104	4,729	128,840	.....	7,633	237,146	178,918	17,315	161,603	45,927
Oahu Ry. & Land Co.	114	84,254	21,734	114,285	10,123	7,190	646	24,107	.....	4,066	46,132	68,154	7,250	60,904	24,728
Oregon Short Line	2,259	1,569,424	455,885	2,182,103	286,823	207,313	37,018	465,036	31,941	57,098	1,084,057	1,098,047	135,884	961,359	179,040
Oregon-Washington R. R. & Nav. Co.	2,027	949,916	460,716	1,539,962	179,606	147,396	47,478	413,272	13,521	60,180	861,022	678,941	92,911	585,929	990
Philadelphia & Reading	1,120	3,645,227	596,529	4,447,759	354,228	687,031	45,553	1,432,647	11,347	67,981	2,597,274	1,850,484	100,502	1,749,500	308,082
Pittsburgh, Shawmut & Northern	294	173,489	9,950	186,721	33,065	43,981	1,520	50,347	.....	4,190	133,103	53,618	1,853	51,765	47,983
Port Reading	21	108,376	.....	132,139	9,781	16,480	38	39,695	.....	117	66,111	66,027	10,000	56,027	10,719
Richmond, Fredericksburg & Potomac	88	105,670	82,852	219,160	22,038	30,728	3,349	76,766	2,735	6,842	142,459	76,701	7,586	69,095	49,997
St. Louis & San Francisco	4,750	2,577,525	916,939	3,732,364	712,102	567,854	63,058	1,120,918	.....	88,152	2,538,024	1,194,340	133,241	1,059,696	—121,965

REVENUES AND EXPENSES OF RAILWAYS

MONTH OF SEPTEMBER, 1915—CONTINUED.

Name of Road.	Average mileage operated during period.	Operating revenues			Operating expenses							Net from railway operation.	Railway tax accruals.	Operating income (or loss).	Increase (or decr.) comp. with last year.
		Freight.	Passenger	Total (inc. misc.)	Maintenance of Way and structures.	Maintenance of Equipment.	Traffic.	Transportation.	Miscellaneous.	General.	Total.				
St. Louis, Brownsville & Mexico	548	$194,897	$77,620	$289,564	$41,895	$36,989	$5,409	$73,549	.....	$10,304	$167,980	$121,584	$6,500	$115,053	$55,240
St. Louis, Iron Mountain & Southern	3,363	1,872,283	457,547	2,515,293	467,462	501,900	58,532	689,276	6,537	60,282	1,783,325	731,968	110,935	614,721	—91,539
St. Louis Merchants' Bridge Terminal	9	.....	226	178,415	18,803	8,416	879	72,730	.....	11,320	112,147	66,268	6,540	59,727	20,468
St. Louis, San Francisco & Texas	244	57,762	24,198	89,012	27,157	17,149	1,914	40,803	.....	3,709	90,732	—1,719	1,216	—2,936	—459
St. Louis Southwestern	943	480,280	108,494	623,073	44,781	94,469	27,163	147,014	3,611	23,585	339,903	283,170	29,760	253,304	91,416
St. Louis Southwestern of Texas	811	237,929	82,981	346,060	50,579	79,187	10,822	130,144	727	16,594	279,022	67,038	15,033	51,873	86,863
San Antonio & Aransas Pass. (Passenger)	724														
San Antonio & Aransas Pass. (Freight)	724	342,143	100,527	464,123	61,538	56,774	6,787	147,834	.....	11,679	284,568	179,555	15,732	163,744	77,005
San Pedro, Los Angeles & Salt Lake	1,132	494,809	249,946	830,469	87,397	129,086	33,309	250,808	25,217	17,795	543,612	286,857	51,296	235,535	16,570
Southern	7,022	3,738,442	1,401,218	5,616,934	698,607	862,666	152,809	1,835,533	28,992	161,476	3,704,416	1,912,518	232,144	1,678,891	641,212
Southern Pacific	6,928	5,975,006	3,240,665	10,157,002	1,011,137	1,356,566	199,440	2,979,886	200,873	224,687	5,957,325	4,199,677	407,639	3,790,941	312,452
Spokane, Portland & Seattle	56	267,908	155,897	466,787	44,274	33,971	8,773	96,217	3,909	12,780	199,925	266,863	53,400	213,396	—10,980
Staten Island Rapid Transit Co	11	44,953	25,994	103,191	6,245	4,757	693	36,094	.....	2,476	50,265	52,926	5,000	47,925	3,342
Tennessee Central	294	102,277	37,361	148,578	28,863	17,098	5,128	50,714	.....	6,379	108,182	40,395	4,684	35,657	26,349
Terminal R. R. Assn. of St. Louis	35	.....	217	240,094	19,121	14,408	1,000	71,237	.....	10,640	116,405	123,689	27,334	96,355	—4,560
Texas & New Orleans	468	261,611	90,263	390,007	51,608	71,894	7,186	123,068	11,565	9,780	275,100	114,907	18,335	96,484	148,362
Texas & Pacific	1,944	1,045,017	364,952	1,518,083	215,246	291,936	37,173	558,871	11,915	39,814	1,153,861	364,223	76,000	287,770	—21,880
Toledo & Ohio Central	436	336,505	59,773	422,930	50,095	80,000	6,479	137,586	1,824	9,844	285,828	137,102	21,000	116,061	—128,080
Toledo, Peoria & Western	248	63,562	41,651	111,951	16,617	25,614	2,208	37,632	.....	3,629	85,699	26,252	6,100	20,152	11,574
Toledo, St. Louis & Western	451	392,069	34,204	457,368	70,259	72,481	16,058	140,422	.....	7,742	306,962	150,406	17,400	133,006	43,648
Ulster & Delaware	129	43,518	31,812	91,626	13,557	9,168	870	37,630	51	2,985	64,260	27,366	3,500	23,851	13,361
Union Pacific	3,618	3,850,985	1,056,284	5,430,398	726,695	588,277	116,061	1,203,639	92,118	126,590	2,849,976	2,580,423	200,338	2,379,839	—176,018
Union R. R. of Baltimore	9	113,216	26,674	141,442	15,356	.....	.....	4,501	.....	2,214	22,071	119,371	5,806	113,566	—14,667
Union R. R. of Pennsylvania	31	.....	.....	501,560	39,807	86,287	100	156,275	.....	3,080	285,548	216,011	7,500	208,511	70,548
Vandalia	910	720,284	223,391	1,058,310	149,064	178,482	22,262	337,482	9,690	25,083	922,063	336,247	38,252	297,934	56,930
Vicksburg, Shreveport & Pacific	171	88,178	35,802	136,873	23,536	25,208	3,504	40,331	2,154	4,752	99,485	37,388	8,100	29,288	17,745
Virginia & Southwestern	240	156,530	14,977	176,356	23,427	38,576	2,022	44,782	.....	4,675	113,482	62,874	6,402	56,473	10,181
Virginian	504	528,731	41,690	608,239	62,305	98,258	5,438	114,477	12,561	14,511	304,273	303,966	20,000	283,966	26,699
Wabash	2,519	2,031,130	610,732	2,875,797	365,809	441,237	87,351	972,943	16,376	60,495	1,942,764	933,033	82,309	850,350	161,704
Washington Southern	36	37,225	48,105	110,621	15,877	13,249	1,281	33,892	1,216	2,988	68,502	42,118	3,540	38,577	17,799
West Jersey & Seashore	358	212,467	464,618	741,177	97,755	83,912	19,451	248,420	2,943	14,407	466,888	274,288	28,700	245,566	70,637
Western Maryland	664	997,832	92,666	930,244	105,263	148,752	21,047	302,228	6,114	19,127	601,782	328,462	27,000	301,462	140,785
Western Pacific	941	402,789	227,197	680,626	112,766	62,349	21,566	187,786	18,956	18,874	422,297	258,329	29,854	228,422	96,305
Western Ry. of Alabama	133	67,387	34,904	114,524	17,945	24,397	5,013	29,280	1,543	4,413	82,586	31,938	6,169	25,228	6,533
Wheeling & Lake Erie	512	648,712	53,901	749,501	107,427	125,307	5,945	196,968	1,330	13,886	450,863	298,637	34,704	263,933	110,617
Yazoo & Mississippi Valley	1,382	870,793	181,437	1,100,166	181,291	172,538	17,961	317,442	1,329	27,237	717,432	382,734	50,000	332,372	161,616

THREE MONTHS OF FISCAL YEAR ENDING JUNE 30, 1916.

Name of Road.	Average mileage operated during period.	Operating revenues			Operating expenses							Net from railway operation.	Railway tax accruals.	Operating income (or loss).	Increase (or decr.) comp. with last year.
		Freight.	Passenger	Total (inc. misc.)	Maintenance of Way and structures.	Maintenance of Equipment.	Traffic.	Transportation.	Miscellaneous.	General.	Total.				
Alabama & Vicksburg	143	$241,082	$105,452	$380,146	$50,978	$89,483	$10,185	$132,971	$6,428	$16,307	$306,983	$73,163	$23,536	$49,628	$15,770
Alabama Great Southern	309	841,806	287,107	1,208,002	116,101	271,682	38,577	377,014	10,358	24,695	836,921	371,081	45,476	325,591	89,880
Ann Arbor	294	378,777	168,704	590,225	73,163	97,464	14,949	212,827	1,860	24,765	425,028	165,197	38,400	126,658	—40,329
Arizona Eastern	378	587,696	107,448	739,269	96,024	73,915	6,905	157,108	2,783	31,287	367,723	371,546	42,760	328,770	158,796
Atchison, Topeka & Santa Fe	8,620	16,403,861	8,423,657	27,155,800	3,791,378	4,164,903	605,916	7,164,126	.....	495,098	16,148,724	11,007,076	1,235,355	9,761,604	1,361,388
Atlanta, Birmingham & Atlantic	638	520,205	140,359	715,750	117,731	125,353	37,237	282,735	71	28,632	591,759	123,991	39,300	84,656	30,866
Atlanta & West Point	93	151,591	116,716	309,739	39,927	67,508	16,248	92,572	7,273	13,105	236,635	73,104	16,575	55,474	25,483
Atlantic City	170	234,325	733,483	1,002,565	85,430	67,514	11,704	409,192	282	7,033	583,151	419,414	30,000	389,332	6,825
Atlantic Coast Line	4,699	4,371,060	1,678,782	6,554,354	1,103,332	1,373,840	157,381	2,503,989	19,416	209,135	5,364,159	1,190,195	422,000	763,323	254,276
Atlantic & St. Lawrence	167	209,847	93,894	334,886	69,441	54,821	10,962	151,362	.....	11,160	197,746	37,140	34,515	2,621	—23,766
Baltimore, Chesapeake & Atlantic	88	228,964	165,557	410,623	32,808	92,899	5,478	190,298	.....	9,408	330,891	79,732	6,798	72,934	—45,438
Baltimore & Ohio	4,535	21,425,797	4,204,742	27,637,429	3,006,510	5,444,567	490,774	8,321,356	141,381	569,411	17,972,335	9,665,094	847,985	8,810,857	1,936,906
Baltimore & Ohio Chicago Terminal	79	.....	2,352	405,075	56,429	48,106	2,640	163,617	6,367	16,203	283,225	121,851	52,961	67,523	1,047
Bangor & Aroostook	632	506,138	177,625	738,692	147,530	148,920	8,368	217,837	9,977	32,478	565,035	173,657	38,025	135,630	—18,419
Belt Ry. Co. of Chicago	26	.....	.....	681,350	50,204	79,685	1,674	267,158	.....	15,769	414,489	266,860	32,276	234,585	—154,514
Bessemer & Lake Erie	205	3,527,885	127,221	3,699,392	243,341	489,213	27,005	697,679	.....	36,192	1,465,281	2,234,111	50,367	2,183,733	203,462
Bingham & Garfield	27	496,080	9,149	506,808	53,499	39,355	2,990	60,671	392	5,739	162,646	344,162	11,902	332,260	143,896
Boston & Maine	2,302	7,002,738	4,616,203	12,734,258	1,532,310	1,581,887	119,372	4,996,026	53,418	286,500	8,569,513	4,164,745	484,091	3,680,654	1,239,923
Buffalo & Susquehanna R. R. Corporation	253	352,211	21,867	379,943	68,890	98,994	3,218	99,394	.....	16,709	287,205	92,738	7,800	84,938	36,824
Buffalo & Susquehanna Railway	91	48,557	20,730	76,858	14,692	15,497	1,356	34,722	88	7,029	73,384	3,474	4,800	—1,330	18,384
Buffalo, Rochester & Pittsburgh	586	2,487,114	322,637	2,924,327	557,292	597,033	36,059	828,551	3,266	62,552	2,084,753	839,575	60,000	779,565	47,32[illegible]
Canadian Pacific Lines in Maine	233	123,853	52,677	196,187	64,297	37,307	15,473	84,905	.....	10,236	212,218	—16,031	36,000	—52,031	11,287
Carolina, Clinchfield & Ohio	283	567,205	59,585	640,263	64,833	79,100	23,864	109,071	.....	26,208	299,738	340,526	42,750	297,692	39,751
Carolina, Clinchfield & Ohio of S. C.	18	28,343	3,872	33,145	3,999	242	5,120	6,654	.....	1,774	17,682	15,464	2,250	13,214	—926
Central of Georgia	1,924	1,909,835	790,770	2,981,584	416,453	500,209	104,079	1,001,632	3,437	116,198	2,140,040	841,544	154,104	684,902	103,601
Central New England	304	927,237	127,828	1,098,622	168,567	96,240	3,953	279,417	.....	14,007	561,487	537,135	38,400	498,729	268,382
Central of New Jersey	681	5,672,482	1,998,291	8,147,509	659,114	1,478,170	105,217	2,689,752	43,345	163,943	5,139,538	3,007,971	351,037	2,656,934	—78,579
Central Vermont	411	641,177	292,015	1,020,985	153,101	164,580	28,257	403,826	6,228	20,116	776,107	244,878	46,770	198,106	35,828
Charleston & Western Carolina	343	284,527	80,913	384,886	80,184	51,638	9,762	140,294	.....	13,426	295,304	89,583	15,000	74,581	42,231

Traffic News

The Denver & Rio Grande no longer issues rebate checks to passengers paying cash fare on trains when they might have bought tickets; the extra ten cents collected is retained by the company.

It is announced at Ottawa that the Canadian Northern will begin running passenger trains through to the Pacific coast November 22, arrangements having been made with the Great Northern Railway for the use of that company's station at Vancouver.

The Southern Pacific is asking bids for two large freight steamships to be used in coastwise traffic between New York and the Gulf of Mexico. At present this company is using between Galveston and Atlantic ports eight extra steamships chartered from other lines.

"The Philadelphia Passenger Association" is the name of an organization which has been formed in that city by railway and steamship traffic men; president, S. B. Barnitz, Pennsylvania Railroad; secretary, J. M. Stuard, Pennsylvania Railroad. It is proposed to have luncheons every Tuesday at the Adelphia hotel.

The Baltimore & Ohio reports carrying over its line a shipment of rails for the Pacific coast which filled 1,900 cars. Cars are in demand just now, and so special agents of the company have gone west with the rails to make sure that they are moved promptly on their western trip and that the cars are returned as soon as possible after being unloaded.

The United States war department has announced a hearing to be held at Chicago on November 16, on the application of the governor of Illinois for approval by the war department of the plan for an 8-ft. waterway from the lower end of the Sanitary Canal to Utica, Ill., on the Illinois river, which was authorized by the Illinois legislature by act of May 27. The hearing will be held before W. B. Judson, Lieut. Col. Corps of Engineers, United States army, and shippers and others who are interested have been invited to attend and express their views at the hearing.

The damage done by the storm at Galveston last August, combined with the stoppage of freight at the Panama Canal, together with a great increase of shipments in all directions, has caused an unprecedented congestion of freight at Gulf ports. During the last two weeks 18 ships have cleared from Galveston for Atlantic ports, and the Southern Pacific is now sending out from there an average of one ship every day. At New Orleans the company has had to refuse all eastbound freight and may have to keep up the embargo for some little time longer.

The Georgia State Railroad Commission has refused to authorize the Southern Express Company to make increases in its charges for transportation of merchandise, which, according to the application of the company, would have amounted to about four per cent. The commission says that because of the abnormal conditions prevailing during the past year, it will be impossible to decide whether or not the increases granted in 1914 have been sufficient. It is suggested that after the end of the present fiscal year the express company make another application.

Representatives of the Chicago Association of Commerce, the Illinois Manufacturers' Association, the National Industrial Traffic League and a number of other commercial associations, as well as of the railroads in Central Freight Association territory, appeared at a hearing before the Treasury Department at Washington last week to protest against an order requiring exporters to prepare and forward with their freight an original export declaration and an abstract thereof, to accompany the same to the port of exportation, stating the actual cost and the market value, at the time and place of shipment, and the name, flag and motive power of the ship on which the shipment is to be carried. Representatives of the shippers declared that compliance with this order was impracticable, while the representatives of the carriers thought it would be their duty to refuse shipments unless the order was strictly complied with.

Traffic Club of New York

The annual meeting and election of officers of the Traffic Club of New York will be held at the Waldorf-Astoria Hotel on Tuesday evening, November 23. In connection with the meeting there will be an informal dinner at 7 o'clock.

Official Freight Classification Committee

The roads in official classification territory, comprising all the lines in the Central Freight Association, Trunk Line and New England territories, have organized the "Official Classification Committee," to begin operations December 1. This committee, of four members, will supersede the present arrangement, which calls for a committee of large membership, composed of active freight representatives of a number of lines. This new permanent committee will remain in continual session, and thereby avoid the difficulties incident to handling official classification matters at large general meetings.

The new committee consists of R. N. Collyer, chairman; J. W. Allison, now assistant general freight agent of the Baltimore & Ohio Southwestern; D. T. Lawrence, general freight agent of the Central Vermont, and F. W. Smith, of the Uniform Classification Committee. The office will be at Trunk Line headquarters, 143 Liberty street, New York.

It will now be possible for shippers interested in classification matters to get the questions they desire before the committee for immediate consideration, and delays incident to the former practice will be avoided.

New Florida Passenger Trains

Announcement is made that a new passenger train is to be put in service on November 21, between Chicago and Jacksonville, Fla., via Cincinnati and Atlanta, over the Pennsylvania Lines, Louisville & Nashville, Central of Georgia, Georgia Southern & Florida and Atlantic Coast Line. The new train is to be called "The Southland," and will leave Chicago at 12:01 a. m. daily. It will have through drawing-room sleeping cars and coaches between Chicago and Jacksonville with dining car and observation car south of Cincinnati. Sleeping cars will also be run daily between Indianapolis and Jacksonville via Louisville, and between Grand Rapids and Jacksonville semi-weekly. The train will arrive at Jacksonville at 8:45 the second morning. Northbound it will leave Jacksonville at 8:20 p. m., and arrive at Chicago at 7:45 the second morning. The "Royal Palm" train between Chicago and Jacksonville over the Cleveland, Cincinnati, Chicago & St. Louis, the Queen & Crescent and the Southern Railway, under its new winter schedule, effective November 1, leaves Chicago at 7:20 a. m. and arrives at Jacksonville at 8:40 the second evening. In addition to the "Royal Palm," the "Florida Special," between Cincinnati and Jacksonville, effective on November 21, will leave Cincinnati at 8:10 p. m., arriving at Jacksonville the next evening at 8:50, and northbound will leave Jacksonville at 7:10 a. m., arriving at Cincinnati the next morning at 8:10.

Hearing on Illinois Five Per Cent Rate Case

Representatives of the Illinois railroads at a hearing before the Illinois Public Utilities Commission last week, made the general presentation of their case for a 5 per cent general advance in intrastate freight rates in Illinois, with the exception of the rates on grain and those on coal. The coal rates it is proposed to advance 10 cents a ton. The railroads were represented by E. C. Kramer of the Southern Railway, and A. P. Humburg, commerce attorney for the Illinois Central. The tariffs were filed with the commission in October, 1914.

Mr. Kramer made an opening statement outlining the railroads' testimony, which was based largely on statistics for 26 roads operating 81 per cent of the mileage in the state, making comparisons between the years 1908 and 1914. These figures showed that the total operating revenues of the roads had increased from $131,741,000 in 1908, to $169,991,000 in 1914, but that the net railway operating income had decreased from $33,414,000 to $28,865,000, or 18.6 per cent, on Illinois business alone, whereas on the entire systems of the roads the net railway operating income had increased 3.85 per cent. The roads had separated their revenues and expenses between Illinois business and interstate business and between freight and passenger business. In 1908 the roads had earned a return of 5.66

per cent, and in 1914 of only 4.13 per cent on their valuation, taking the assessed valuation fixed by the board of equalization as 70 per cent of the real value. Capitalizing the net revenue at 7 per cent in 1908, this would include an investment of $112,743,000 paying no returns in that year, and of $286,940,000 paying no return in 1914. In 1908 the roads had earned 7 per cent on a valuation of $50,844 a mile, and in 1914, on a valuation of only $41,387 a mile. The increase in revenue from the rates asked is estimated at $2,000,000 a year, or less than the increase in taxes. The increase in wages due to higher wage scales, from 1908 to 1914 was $33,273,000, and in 1894 alone was $10,800,000, or five times the amount of the increase in revenue asked. Mr. Kramer said that the statistics would probably show that the railroads ought to begin by advancing passenger rates, but that the commission could not help them in this respect, as the passenger rates are fixed by the legislature. He admitted that a showing might be made of some rates that are lower in adjoining states, but said that the roads intended to try to secure some advances on these rates in other states; that it would not be fair for the Illinois commission to withhold its decision of the case pending action in Indiana, nor for the Indiana commission to await the action in Illinois.

The witnesses for the railroads were S. M. Felton, president, Chicago Great Western; W. J. Jackson, receiver, Chicago & Eastern Illinois, and L. E. Wettling, statistician for all roads. Mr. Felton referred to the constantly narrowing margin between earnings and expenses and the increases in wages to employees, saying that the average rate per day had increased from $2.27 in 1908 to $2.55 in 1914, and that the increase per mile of line was $2,251. Labor costs per train mile had increased from 98 cents to $1.26. The expenses for maintenance of way and structures had increased from $16,790,445 to $22,037,869, or from $1,788 to $2,212 per mile. Maintenance of equipment expenses had increased from $2,017 to $3,303 per mile. Meanwhile the revenue per mile had decreased from 6.72 mills to 6.23 mills. Large reductions in freight rates were made by the legislature in 1906, and in passenger rates in 1907. Rigid economy in operation had enabled the roads to increase their average revenue per train mile from $2.57 to $3.13, but, he said, it is not reasonable to expect a much further increase in economy in operation. The average tonnage per train had been increased from 382 to 502, and the average tonnage per loaded car from 18.91 to 20.96. Operating expenses had increased from $92,966,377 to $131,227,505. Taxes had increased $2,300,000. He also spoke of the increased difficulty of financing, saying that a railroad that does not pay a dividend cannot sell its bonds at a fair price. Mr. Jackson testified regarding increases in wages and in other operating expenses caused by legislation, and Mr. Wettling explained the detail statistics.

The advance was opposed by the Chicago Association of Commerce and a number of other shippers' organizations on the ground that the present Illinois rates are higher than the Central Freight Association rates for interstate traffic.

New Haven Football Traffic

On the occasion of the Yale-Princeton football game last Saturday the New York, New Haven & Hartford in less than four hours unloaded at New Haven 20,232 passengers, a record performance for a Yale-Princeton game. Of the total of 20,232 passengers 13,277 were carried in special and regular trains from New York and 6,955 from Boston and other points. It required the use of 23 special trains and 22 regular trains. Leaving New Haven after the game, 20 special and 22 regular trains carried 19,678 passengers, most of whom were on special trains leaving between 5 p. m. and 7 p. m. There were no mishaps of any kind. Of the 45 trains in the forenoon, regular and special, 32 were on time and the others were but a few minutes late. The total number of minutes late of all trains arriving in New Haven during the morning was 113, or an average of about 2½ minutes per train. All trains from New York City were drawn by electric motors. The first train left New York at 7.56 a. m. and the last at 11.25 a. m. The special instructions of the operating department filled a 20-page pamphlet. Special telephones were installed at various points in yards and terminals to facilitate the movement of trains, and officers of the traffic, operating, engineering and mechanical departments were stationed at different points on the route to be on hand in case their help were needed.

Commission and Court News

INTERSTATE COMMERCE COMMISSION

Examiner Watkins of the Interstate Commerce Commission will hold a hearing in St. Louis on November 29 on some additional advances in western freight rates proposed by the roads after the beginning of the general western rate advance case, on which hearings were held at Chicago in the spring.

A hearing was begun before an examiner of the Interstate Commerce Commission at St. Louis on November 15, on a complaint filed by the Business Men's League of St. Louis, charging discrimination against St. Louis and in favor of certain Illinois merchants because the interstate rates charged them from St. Louis are higher than the intrastate rates from Chicago and other points within the state. The commission is asked to remove the discrimination by advancing the Illinois rates. A large number of representatives of shippers and railroads and of the Illinois Public Utilities Commission attended the hearing, which has to do with both freight and passenger rates.

Increased Rates not Justified

J. G. Peppard Seed Company v. Atchison, Topeka & Santa Fe. Opinion by the Commission.

The commission finds that the carriers have not justified an increase in proportional rates on sorghum seed and cane seed in carloads from Kansas City, Mo., to destinations in Texas. (36, I. C. C. 311.)

Complaint Dismissed

New Jersey Zinc Company v. Central of New Jersey. Opinion by the Commission.

The commission finds that the assessment of demurrage on carload shipments of zinc ore forwarded to Jersey City, N. J., for export, but not exported on account of war conditions, was not unreasonable. (36, I. C. C. 289.)

Detention Charges on Heater Cars

Providence Fruit & Produce Exchange v. Maine Central et al Opinion by the commission.

Effective November 1, 1914, the New England carriers established what are termed detention charges, applicable during the winter months, on cars provided with heating apparatus. These charges are assessed after the expiration of the two-day free demurrage period at the rate of $1 per car per day for the first two days, and $2 per car per day for each succeeding day, and are additional to the demurrage charge of $1 per day.

The commission finds that these charges, on the whole, are not unreasonable. It has held uniformly that carriers may impose charges necessary to compel the removal of freight from the carriers' terminals and the prompt release of equipment, and in several cases has sanctioned detention charges equal to the charges assailed. The carriers will be expected, however, to modify their tariffs containing the detention charges to conform to the rules governing the waiver of demurrage charges because of weather interference or because of bunching in transit. (36, I. C. C. 307.)

STATE COMMISSIONS

J. Sergeant Cram, a member of the New York State Public Service Commission, First district, reporting on an investigation of safety at highway crossings on the Long Island Railroad, recommends that the commission issue an order requiring the railroad company to increase its supervision over the flagmen, especially during the late night and early morning hours; and he holds that the working day of 12 hours ought to be reduced to 8 hours, and the minimum pay of $1.50 a day increased to at least $2. The company employs 309 crossing flagmen within the limits of New York City, of whom 244 receive $1.50 a day. There is only one supervisor or inspector of gatemen for the territory within New York City.

COURT NEWS

The United States District Court at Pittsburgh, Pa., in a case against the Pennsylvania Railroad, holds that a common carrier need not furnish special cars for shipments of oil. A decision of the Interstate Commerce Commission requiring the road to supply enough cars to move the output of the refineries of the Crew-Levick Company and the Pennsylvania Paraffine Works was suspended and ordered annulled. "The law," says the decision, "confers upon the Interstate Commerce Commission power to regulate the use of facilities possessed by the railroad; but there is nothing in it to compel a railroad to acquire facilities it does not possess, or to acquire better facilities than those it possesses. . . . The commission exceeded its statutory powers." Judge W. H. S. Thompson dissented from the majority opinion, holding that the decision would open the way for discrimination by railroads.

Mileage Ticket Good for Holder's Wife

The Supreme Court of the United States on Monday last, in a case which arose on the Southern Railway, held, in an opinion by Justice Hughes, that rules governing the use of mileage books are to be construed literally and that the provision forfeiting the book, or tickets issued in exchange therefor, if presented by other than the "original purchaser" means exactly what it says. But the court construes the rule as not working a forfeiture if the book is presented by the "original purchaser," even if presented for the fare of another passenger.

Samuel J. Campbell purchased two 1,000-mile tickets in North Carolina for an interstate journey. He exchanged the coupons from the book for the necessary mileage in tickets covering transportation for himself and wife. When he presented the tickets the conductor took up the coupon book, holding that Campbell had forfeited the book by presenting transportation for his wife.

The court held that so long as the tickets and mileage book were presented by the "original purchaser" the rule of forfeiture did not apply, no matter who rode on the transportation.

Walking Along Tracks Contributory Negligence Under Wisconsin Statute

In an action for damages for death caused by being knocked down by a switch engine while walking along the track, it was assumed by the Wisconsin Supreme Court that the deceased was a licensee and not a trespasser. A Wisconsin statute makes it unlawful for any person other than those connected with or employed upon the railroad to walk along the track of any railroad except when such track shall be laid along public streets. Assuming that this alone would not charge the deceased with contributory negligence, the court held that it went a long way in that direction. Taken along with the facts that it was a dark night, that warning notices were posted, and that it would be difficult or impossible to avoid passing trains, it was held to require a finding of contributory negligence. Where the act is manifestly dangerous and there is no overmastering necessity requiring that such act be done, the fact that others had the hardihood or the carelessness to take the same risk cannot be taken to authorize the injured party to voluntarily expose himself and yet recover for the injuries sustained by him in direct consequence of such exposure.—Zemke v. C. & N. W. (Wis.), 154 N. W. 364.

Railroad's Right to Remove Switch

In 1897 a railroad, at the expense of the owner of a warehouse, built a track to the warehouse, under an agreement providing that on 10 days' notice it might discontinue it, on paying to the owner the value of the part removed. In 1907 the New York Public Service Commissions Law was enacted, section 27 of which empowered the commission, in case a railroad failed to install a switch upon due application, to investigate and order its establishment, and upon application of a railroad to order a discontinuance of any switch. In 1906 Interstate Commerce Act, section 1, was amended so as to give similar powers to that commission, without specifically providing for the discontinuance of sidings. The New York Appellate Division, in an action to enjoin the removal of the track, holds that even though, in the absence of statute, it was within the railroad's discretion to build and discontinue sidings and to remove those built at its own expense, yet as the plaintiff's track was constructed at its expense, defendant could not deprive plaintiff of it without reserving the right to do so; that the intervention of the commission was not authorized, unless the parties were unable to agree, and that, as the reservation was a partial surrender of the railroad's right to remove the track at will, it was an agreement not nullified by the statutes.—Adikes v. Long Island, 151 N. Y. Supp. 49.

Injuries to Passengers—Contributory Negligence

A brakeman, when told that a passenger desired to alight at a station and go to a hotel there, informed him that the station was on one side of the track and the hotel on the other, and that when the train reached there he would show the passenger where to get off. The brakeman, on reaching the station, at or about the time he opened the door leading down to the steps of the car, said to the passenger, "There is your hotel." The passenger alighted while the train was in motion, and was injured. In an action for his injuries the federal district court of California, S. D., held that the railroad was not guilty of any negligence, for the conduct of the brakeman was not an invitation or instruction to the passenger to alight, nor an inducement to the passenger to get into a place of danger, causing him to fall from the car. The night was dark, the train was moving at a considerable speed, and the passenger, who was encumbered with a grip, was unfamiliar with the condition of the ground. It was held that he was guilty, as a matter of law, of contributory negligence, precluding a recovery for injuries sustained.—Murray v. Southern Pacific, 225 Fed. 297.

Libel in Letter by Passenger to Railroad Complaining of Conductor's Conduct

The California supreme court has affirmed a judgment of the district court of appeals, Third District (150 Pac. 1005), awarding $5,000 damages to a railroad conductor who was thrown out of his employment, with little prospect of getting another position, as the result of a letter sent by the defendant, a passenger, to the company's general passenger agent, in which it was stated that the conductor had spoken roughly to a passenger who had boarded the train by mistake, and in reply to another passenger who spoke about the heat of the car had used loud and vulgar language, referring to the trainmen's reasons for having it hot. The letter also stated that on two former occasions within six months the writer had seen similar exhibitions of coarse and disagreeable deportment on the part of the conductor, and ascribed such conduct to the influence of liquor. The court of appeals held the letter to be libelous per se. The supreme court gives no reason for its decision beyond the statement that the jury evidently found that in the writing and publication of the letter the defendant was actuated by actual malice toward the plaintiff; but it did not agree with the opinion of the court of appeals that before libelous matter can be privileged it must appear that it was and is substantially true.

In commenting upon these decisions the California Law Review discusses the question whether one publishing a libel in response to a public notice will be accorded the same protection as one acting upon a personal request. In general, all instances of privilege have as a basis the making of a statement in the discharge of some public or private duty or interest, whether legal or moral. Development in this branch of the law has been marked by a widening of the interest or duty necessary to make a privileged occasion. The modern tendency is to apply the rule liberally, having regard for the general welfare of society; so that it is privileged not only to give a character to a former servant, at the request of a prospective employer, but even, as has been held, to volunteer information to a person interested where it is right in the interests of that person or of society that he should be informed. "In view of this development," the Review continues, "it would seem but natural to extend the rule of privilege to the new situation, where the request for information appears in the form of notices to the public at large. If information given at the request of the recipient is privileged and voluntary communications intended to benefit society are also being held privileged, it seems but just that the giving of information to one interested, at his public request, and for the benefit of himself and society, should also be privileged."—Adams v. Cameron (Cal.), 151 Pac. 286.

Lessee to Pay Taxes

The Supreme Court of the United States, in an opinion by Justice McReynolds, decides in favor of the State of New Jersey in its suit to collect taxes from the Lehigh Valley as lessee of the right of way and property of the Morris Canal. The railroad company had resisted the payment of accumulated taxes amounting to about $900,000 under exemption provided in the charter from the State of New Jersey to the Morris Canal & Banking Company. The Court of Errors and Appeals of New Jersey had held the railroad liable to taxes. The action of the Supreme Court affirms that judgment. The case has been before courts for many years. Under the original grant the canal and its appurtenances were exempted from taxation, provided it be maintained for navigation. In 1871 the company was allowed to sell or lease. The Supreme Court holds that the right to sell conferred on the company in 1871 did not carry exemption of taxes and that such an exemption only followed when the original company used the canal for navigation; and that, after leasing, the privilege of exemption lapsed. The case involved taxes amounting to about $900,000 paid by the company to the state under protest.

Diamonds as "Baggage"

In an action for the loss of the contents of a passenger's trunk, among which was said to have been a diamond, it was contended that the diamond was not properly baggage, and that the railroad, therefore, would not be liable as an insurer. Articles of extraordinary value are not properly classed as baggage, as, for example, papers or memoranda of great and special importance in business, or jewelry of exceptional value. The question as to what is properly baggage for which the carrier is liable as an insurer is, the Nebraska Supreme Court holds, a mixed question of law and fact. If the evidence is without substantial conflict it is ordinarily one of law for the court, but if it depends on facts from which reasonable men might draw either conclusion, the question is for the jury under proper instructions. If the property is not properly baggage, the carrier would still be liable if its loss was caused by its own gross negligence, but not if it is caused by accident, or the act of some third party, or even by ordinary negligence of the carrier. A diamond is an article having market value, and it is error to instruct a jury that the measure of damages for its loss is to be determined by what it is worth to the owner and not by what it would bring on the market.—Gibbons v. Chicago, B. & Q. (Neb.), 154 N. W. 226.

Crossing Accident—Signals, Gates or Flagman—Excessive Speed Not Necessarily Negligence

In an action for damages to an automobile in a crossing collision in a town it appeared that the driver of the automobile, as he approached the crossing, was looking down and listening to the engine of the automobile, while the other occupants of the car were joking and "kidding" those in another automobile which they had outspeeded. None of them gave any attention whatever to the fact that they were approaching a crossing. The Maine supreme court held that there was gross carelessness in the management of the automobile, and that all the people in the car were negligent.

The railroad did not maintain a flagman, gates or automatic signals at the crossing, but it was held that this did not constitute negligence on its part, as no request therefor had ever been made by the town authorities or by any public commission of the state; there were no deep cuts or embankments or high blocks of buildings to prevent a traveler hearing the whistle and bell and the noise of an approaching train, and the trains over the crossing were light and few in number. The train was running at ten to fifteen miles an hour, in violation of a Maine statute providing that no engine or train shall run across a highway near the compact part of a town at a speed greater than six miles an hour, unless a flagman, gates or automatic signals are maintained there. It was held that this fact, though competent evidence on the question whether the train was run at a dangerous rate of speed, was not conclusive of the railroad's negligence.

The evidence was held insufficient to warrant a finding of negligence on the part of the railroad. Conant v. Grand Trunk (Me.), 95 Atl. 444.

Railway Officers

Executive, Financial, Legal and Accounting

H. U. Mudge has been elected president of the Denver & Rio Grande, succeeding Arthur Coppell, who was recently elected temporary president.

Elmer A. Howard, real estate and industrial agent for the Chicago, Burlington & Quincy, with headquarters at Chicago, Ill., has been elected vice-president, with jurisdiction over land and industrial departments, and will perform such other duties as may be assigned to him.

James E. Gorman, whose appointment as chief executive officer for the receiver of the Chicago, Rock Island & Pacific, with office at Chicago, has been announced in these columns, was born December 3, 1863, in Chicago, and received his education at Holy Family school in that city. He began railway work in August 1877, as a car number taker on the Chicago, Burlington & Quincy, and during the following 16 years held various clerical positions with the Burlington, the Chicago, Rock Island & Pacific, the Chicago & North Western, the Chicago, Sante Fe & California, now a part of the Atchison, Topeka & Santa Fe; the Illinois Central and the Atchison, Topeka & Santa Fe, and also with the Chicago Lumber Company. He was appointed traffic manager of Joy Morton & Co., in December, 1893, and in March, 1895, was made chief clerk to the traffic manager of the Atchison, Topeka & Santa Fe. Six months later he was appointed assistant general freight agent, which position he held four years. He was then made general freight agent, and in April, 1904, was appointed assistant freight traffic manager. He was appointed freight traffic manager in March, 1905, which position he held until December 1, 1909, when he was elected first vice-president in charge of traffic of the Chicago, Rock Island & Pacific.

J. E. Gorman

W. S. McChesney was re-elected president of the Wiggins Ferry Company at the annual stockholders' meeting on November 8. Charles E. Schaff, receiver of the Missouri, Kansas & Texas, was elected vice-president to succeed E. B. Pryor, resigned; C. A. Vinnedge was re-elected secretary and auditor, and F. C. Dabb was rechosen treasurer. E. F. Kearney, president of the Wabash, was elected a member of the board, succeeding E. B. Pryor; and T. C. Powell, vice-president of the Southern, and Alexander Robertson, chief operating officer of the Missouri Pacific-St. Louis, Iron Mountain & Southern, were named as the other directors.

Edward B. Pryor, receiver of the Wabash, retired from active railway service with the reorganization of the company on November 1. Mr. Pryor was born on March 8, 1854, at Fayetteville, W. Va., and entered the ranks of railroad employees in 1880. From that time until 1887, he held the consecutive positions of clerk, general bookkeeper, and chief clerk of general accounts for the Wabash, St. Louis & Pacific. From 1887 to January 1, 1903, he was assistant auditor of the same road, and its successor, the Wabash. From July 1, 1900, to January 1, 1903, he was also assistant to the vice-president of the same railroad. From January 1, 1903, to October 18, 1905, he was assistant to the president, and from that time until his retirement vice-president in charge of the treasury and accounting departments. Since December 18, 1911, he has also been a receiver of the railroad. Mr. Pryor will devote his time to the presidency of

the State National Bank of St. Louis, Mo., to which he was elected last year.

Operating

G. A. Stokes has been appointed superintendent of terminals of the Grand Trunk, with office at Port Huron, Mich., vice F. J. McKee, promoted.

George E. Graham has been appointed general manager of the Dominion Atlantic, with office at Kentville, N. S., in place of P. Gifkins, retired.

Richard L. Malone has been appointed trainmaster of the Illinois Central at Fordham, Ill., vice Charles A. Phelan, transferred. Effective November 15.

E. E. Lillie, superintendent of the Spokane & Inland Empire, has been appointed assistant superintendent of telegraph of the Great Northern, with headquarters at St. Paul, Minn. Effective November 1.

Joseph W. Hevron, whose appointment as superintendent of the Springfield division of the Illinois Central has been announced, was born at Rockport, Ind., on February 23, 1880. After enjoying a common school education he entered railway service on April 1, 1894, on what is now the St. Louis division of the Southern. In August, 1898, he entered the employ of the St. Louis, Peoria & Northern, now a part of the Illinois Central, as an operator and yard clerk, and remained with this company until its absorption by the Illinois Central in 1899. On December 25, 1899, he became a telegrapher for the Illinois Central at Gilman, Ill. On March 17, 1900, he was promoted to operator in the despatcher's office at Kankakee, Ill., and on May 1, 1900, was appointed train despatcher in the same office. On January 16, 1907, he was promoted to chief train despatcher of the Chicago, Bloomington, Pontiac & Tracy district, and on July 15, 1913, was made trainmaster of the same district. On November 15, 1915, he was promoted to the superintendency of the Springfield division with office at Clinton, Ill.

Samuel R. Toucey, whose appointment as superintendent of the Wyoming division of the Union Pacific was recently announced, was born at Minneapolis, Minn., on January 24, 1878. In September, 1895, he became a clerk in the service of the Eastern Minnesota and the Northern Steamship Company — now the Great Northern. In December, 1895, he became a freight solicitor for the Lehigh Valley and continued in this position until August, 1896, when he returned to the Great Northern. He held various clerical positions with this company until November, 1898, when he entered the employ of the Chicago, Burlington & Quincy. He remained with this company as rate clerk and stenographer until November, 1900, when he again returned to the Great Northern. He served this road as stenographer, assistant chief clerk and chief clerk to the general superintendent until February, 1903. After taking the company's special student course and subsequently spending several months at Larimore, N. D., as clerk to the division superintendent, he entered the operating department of the Chicago, Rock Island & Pacific, in December, 1903. In February, 1904, he became stenographer and clerk to the general superintendent of the Union Pacific; from April, 1904, to March, 1906, he was private secretary to the president; from March, 1906, to February, 1907, he was trainmaster on the Colorado division, with office at Denver, Colo. From February, 1907, to April, 1907, he was assigned to special duty in connection with the train and enginemen's schedules, at Chicago, Ill. On April 1, 1907, he was appointed assistant superintendent of the Colorado division, with office at Denver, Colo. In October, 1914, he was transferred to the Wyoming division, and on November 1, 1915, was promoted to superintendent of that division, with headquarters at Cheyenne, Wyo.

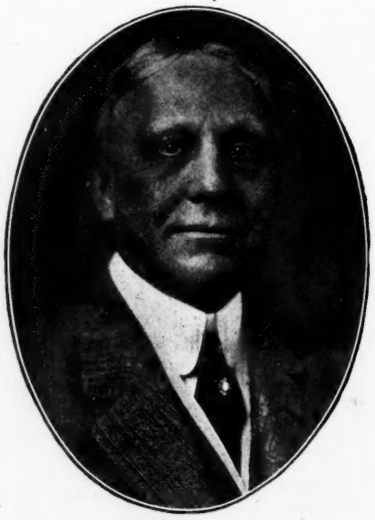
S. R. Toucey

T. J. Jones, whose appointment as superintendent of transportation for the Wabash has been announced, was born at Foristell, St. Charles county, Mo., on January 26, 1874. He received a common school education, and in 1888 entered railway service with the Wabash as a messenger. He has been continuously in the service of the same road ever since, and has held the following positions: telegraph operator, yard clerk, yardmaster, train despatcher and trainmaster. On December 1, 1910, he was promoted to division superintendent, at Moberly, Mo., where he remained until his appointment as superintendent of transportation, with headquarters at St. Louis, Mo., effective November 1.

The general manager of the Canadian Government Railways announces that the Grand Trunk Pacific Telegraph Company has been appointed supervisory agent of telegraphs on the Transcontinental between Moncton, N. B., and Winnipeg, Man., including the Lake Superior branch to Fort William. The telegraph company will have charge of all matters appertaining to the construction and maintenance of telegraphs and telephone lines and operation of railroad and commercial telegraphs. The officers of the Grand Trunk Pacific Telegraph Company having jurisdiction are: H. Hulatt, manager of telegraphs, Montreal, Que.; F. T. Caldwell, division superintendent of telegraphs, Winnipeg, Man., and Thomas Rodger, supervisor, Montreal. Mr. Hulatt is also manager of telegraph of the Grand Trunk and the Grand Trunk Pacific.

Traffic

Frank P. Eyman, who was promoted to freight traffic manager of the Chicago & North Western on November 10, was born on October 5, 1856. He was educated at Oberlin college. In 1873 he entered railway service as agent and operator of the Baltimore & Ohio, following which he was cashier and agent of the Denver & Rio Grande, at Antonito, Colo. From 1880 to 1882, he served as telegraph operator and agent for the North Western; from 1882 to 1887, he was traveling freight agent for the same railroad. From 1887 to 1896, he was stationed at Milwaukee, Wis., as contracting freight agent and local agent, and from 1896 to February 1, 1900, he was general agent, at Chicago, Ill. August 1, 1910, he was From that time until assistant general freight agent, with office in the same city; from August 1, 1910, until his recent promotion he has been assistant freight traffic manager.



F. P. Eyman

W. S. Cookson, assistant general passenger agent of the Grand Trunk at Montreal, Que., has been appointed general passenger agent, and C. W. Johnston, assistant to passenger traffic manager at Montreal, succeeds Mr. Cookson. The positions of assistant passenger traffic manager and assistant to passenger traffic manager have been abolished.

A. G. Reynolds has been appointed commercial agent of the San Antonio & Aransas Pass, with headquarters at Lockhart, Tex.

Frank F. Fouts, general agent of the Denver & Rio Grande at Ogden, Utah, has been appointed to a similar position on the Ogden, Logan & Idaho and hereafter will attend to the freight business of both roads in that city.

William P. Hinton, assistant passenger traffic manager of the

Grand Trunk and the Grand Trunk Pacific, with office at Montreal, Que., has been appointed traffic manager of the Grand Trunk Pacific and the National Transcontinental, with headquarters at Winnipeg, Man. G. A. McNicholl has been appointed assistant general freight and passenger agent of the Grand Trunk Pacific with jurisdiction west of Prince George, B. C., with headquarters at Prince Rupert, B. C. A photograph and sketch of Mr. Hinton were published on November 6, 1914, page 876.

Henry W. Beyers, who was appointed assistant freight traffic manager of the Chicago & North Western on November 10, was born at Toledo, Ohio, on March 26, 1870. He entered the service of the Chicago & North Western in 1883 as clerk in the office of the commercial agent at Chicago, Ill. From 1892 to 1897 he was stationed at Cleveland, Ohio, as general agent, and from 1897 to 1900, held the same position at Philadelphia, Pa. From 1900 to 1906 he was general agent at Chicago, and from 1906 up to the time of his recent appointment, has been assistant general freight agent, with headquarters at Chicago, Ill. His entire career has been in the service of the Chicago & North Western.

H. W. Beyers

N. J. Lee, chief clerk of the passenger department of the New York, New Haven & Hartford, at New Haven, Conn., has been appointed general agent, with headquarters at New Haven.

Samuel L. Seymour, who has been appointed assistant to freight traffic manager of the Pennsylvania Railroad, with headquarters at Pittsburgh, Pa., was born on August 14, 1849, at Cleveland, Ohio, and was educated in the common schools of Buffalo, N. Y. He began railway work on October 22, 1868, with the Pennsylvania Railroad, and until December, 1882, served on the Northen Central. He was chief clerk in the office of the general western freight agent at Buffalo, until May, 1876, and then to April, 1879, was western passenger agent. From April, 1879, to December, 1882, he was western passenger and freight agent. From December, 1882, to June, 1890, he was division freight agent of the Pennsylvania Railroad (Philadelphia & Erie division) and of the Northern Central (Susquehanna, Shamokin, Elmira & Canadaigua disivions) at Williamsport, Pa. In June, 1890, he was transferred as division freight agent to Pittsburgh, Pa., which position he held at the time of his recent appointment as assistant to freight traffic manager of the same road, as above noted.

S. L. Seymour

C. R. Phoenix, commercial agent of the Illinois Central at Pittsburgh, Pa., has been appointed general eastern agent with headquarters at New York, N. Y., vice W. E. Downing, deceased. W. B. Ryan, commercial agent at Little Rock, Ark., has been appointed to succeed Mr. Phoenix at Pittsburgh. Hugh Hardin, traveling freight agent at Dallas, Tex., has been promoted to commercial agent at Little Rock, Ark., vice Mr. Ryan.

Samuel L. Seymour, division freight agent of the Pennsylvania Railroad at Pittsburgh, Pa., has been appointed assistant to freight traffic manager, with headquarters at Pittsburgh; Vernon C. Williams, division freight agent of the New Jersey division at Philadelphia, has been appointed division freight agent of the Western Pennsylvania division, with office at Pittsburgh, succeeding Mr. Seymour; Harold A. Haines, division freight agent at Baltimore, has been appointed division freight agent at Philadelphia, succeeding Mr. Williams. Walter S. Franklin, Jr., southern freight agent of the Pennsylvania System at Atlanta, Ga., has been promoted to division freight agent at Baltimore, succeeding Mr. Haines.

Marvin Hughitt, Jr., who was appointed general traffic manager of the Chicago & North Western on November 10, was born on September 24, 1861, at Bloomington, Ill. He entered railway service in the general freight department of the North Western in 1881, and has remained continuously with the road since that time. From February 1, 1887, to January 1, 1893, he was division freight agent; from January 1, 1893, to October 1, 1896, he served as assistant general freight agent; and from October 1, 1896, to February 1, 1900, as general freight agent. From February 1, 1900, up to the time of his recent promotion he has been freight traffic manager of the road. His headquarters will continue to be in Chicago, Ill.

J. W. Allison, assistant general freight agent of the Baltimore & Ohio Southwestern, with office at Cincinnati, Ohio; D. T. Lawrence, general freight agent of the Central Vermont, with office at St. Albans, Vt., and F. W. Smith, a member of the Uniform Classification Committee, with office at Chicago, have been appointed members of the Official Classification Committee with office at 143 Liberty street, New York City. (See item in Traffic News.)

Engineering and Rolling Stock

A. E. Tripplett, assistant superintendent of the Galveston, Harrisburg & San Antonio, at Victoria, Tex., has been appointed division engineer of the Missouri, Kansas & Texas, at Parsons, Tex.

Purchasing

George G. Yeomans, whose appointment as purchasing agent of the New York, New Haven & Hartford, with headquarters at Boston, Mass., has already been announced in these columns, was born on January 11, 1860, at Trenton, N. J., and graduated from Princeton University. He began railway work in 1882, as rail inspector on the Chicago, Burlington & Quincy. From 1884 to 1886, he was a clerk in the purchasing department, and then to 1891, was chief clerk of the same department. From 1891 to March, 1898, he was assistant purchasing agent, and in March, 1898 was promoted to purchasing agent of the same system, remaining in that position until July, 1905. He served from July to October, 1905, as assistant to first vice-president of the Wabash Railroad and as assistant to president of the Wheeling & Lake Erie, the Wabash Pittsburgh Terminal, the Pittsburgh Terminal Railroad Coal Company and the West Side Belt. From October, 1905, to March, 1912, he was assistant to president of the same roads. Since March, 1912, he has made a specialty of investigating methods of purchasing and handling supplies on various large railroads.

OBITUARY

R. B. Salmons, master mechanic of the Louisville & Nashville at Covington, Ky., since July 1, 1913, died on November 3, at Covington.

C. L. Loop, vice-president of the Southern Express Company at Chattanooga, Tenn., died at his home in that city on November 17, at the age of 76.

C. C. Wentworth, principal assistant engineer of the Norfolk & Western since February, 1903, died on November 11 at his home in Roanoke, Va.

George L. Lang, who was superintendent of telegraph of the Cincinnati, New Orleans & Texas Pacific and the Alabama Great Southern previous to August, 1906, died at Chattanooga, Tenn., on November 13, at the age of 72.

Equipment and Supplies

LOCOMOTIVE BUILDING

The Virginian Railway is in the market for one Mallet type locomotive.

The Lake Superior & Ishpeming is inquiring for prices on two Mikado type locomotives.

The Elgin, Joliet & Eastern is inquiring for prices on 18 Mikado type and 9 switching locomotives.

The Duluth, Missabe & Northern is inquiring for prices on two Mallet and four Santa Fe type locomotives.

The Standard Oil Company, Whiting, Ind., has ordered one six-wheel switching locomotive from the American Locomotive Company, and has withdrawn its inquiry, mentioned last week, for an additional locomotive.

The Missouri, Kansas & Texas has ordered 5 superheater Pacific type locomotives from the American Locomotive Company. These locomotives will have 25 by 28 in. cylinders, 73 in. driving wheels, and a total weight in working order of 272,000 lb.

The Boston & Albany has ordered 4 superheater Mallet (2-6-6-2) type locomotives from the American Locomotive Company. These locomotives will have 22½ and 34 by 32 in. cylinders, 57 in. driving wheels and a total weight in working order of 354,000 lb.

The New York, New Haven & Hartford has ordered 33 superheater Mikado type locomotives from the American Locomotive Company. Of these, 25 will have 25 by 30 in. cylinders, 63 in. driving wheels and a total weight in working order of 260,000 lb. The other 8 will have 26 by 32 in. cylinders, 63 in. driving wheels and a total weight in working order of 325,000 lb.

The Birmingham Southern, reported in the issue of last week as being in the market for 3 locomotives, has ordered one Consolidation type and 2 six-wheel switching locomotives from the American Locomotive Company. All three locomotives will be equipped with superheaters. The Consolidation type locomotive will have 23 by 28 in. cylinders, 53 in. driving wheels, and a total weight in working order of 202,000 lb. The switching locomotives will have 22 by 26 in. cylinders, 52 in. driving wheels and a total weight in working order of 160,000 lb.

CAR BUILDING

The Illinois Central is inquiring for 40 air dump cars.

The Lehigh Valley is in the market for 15 caboose cars.

The Denver & Rio Grande is inquiring for 1,000 box cars.

The Long Island Railroad is inquiring for 100 50-ton composite gondola cars.

The Northern Pacific has ordered 1,000 center constructions from the Western Steel Car & Foundry Company.

The Virginian, reported in last week's issue as being in the market for 250 40-ton box cars, is in the market for box-car bodies only.

The Cincinnati, Indianapolis & Western has ordered 450 box and 200 other freight cars from the Haskell & Barker Car Company.

The Western Maryland is reported to have increased its recent order with the Pullman Company for 2,000 hopper cars to 3,000. This item has not been confirmed.

The Copper Range, reported in the *Railway Age Gazette* of October 1, as being in the market for 40 ore cars, has ordered 50 ore cars from the Pressed Steel Car Company.

Lake Erie & Northern.—Through an error in the printshop it was incorrectly reported in last week's issue that the Lake Erie & Western had ordered 8 steel frame coaches from the Preston Car & Coach Company, Inc. These cars were ordered by the Lake Erie & Northern, a new road, whose main offices are at Brantford, Ont. William P. Kellett is general manager.

The New York, Chicago & St. Louis has ordered 600 center constructions from the Pressed Steel Car Company, and has also given the latter an order to repair 300 hopper cars.

The Chesapeake & Ohio, reported in the *Railway Age Gazette* of November 5, as having ordered 1,000 70-ton coal cars from the Standard Steel Car Company, is now reported to have increased that order to 2,000 cars. It is also reported as contemplating the purchase of 10 express cars.

The Chicago, Burlington & Quincy, reported in an unconfirmed item in the issue of last week, as being in the market for 54 passenger cars, has issued inquiries for eight dining, five mail, 15 chair and nine passenger and baggage cars and 17 coaches, two of which will be provided with smoking compartments.

The New York Central has ordered 1,000 55-ton self-clearing hopper cars from the Standard Steel Car Company for the Pittsburgh & Lake Erie, this order being additional to orders previously reported. It has also ordered 500 box cars from the Haskell & Barker Car Company, and 500 from the American Car & Foundry Company. These two orders for box cars were included in the original quota for these companies, but were later cut off and are now re-established. It is understood that the New York Central will also order more freight cars.

IRON AND STEEL

The Chicago, St. Paul, Minneapolis & Omaha has ordered 10,000 tons of rails from the Lackawanna Steel Company.

The Ogden, Logan & Idaho has ordered 184 tons of steel from the American Bridge Company for shops and car barns at Ogden, Utah.

The Philadelphia & Reading has divided an order for 12,000 tons of rails among the Pennsylvania Steel Company, the Bethlehem Steel Company and the Carnegie Steel Company.

The Chicago, Rock Island & Pacific has ordered 40,000 tons of 90 and 100 lb. rails from the Illinois Steel Company. Deliveries will begin next April and extend until October.

The Chicago & North Western has ordered 30,000 tons of rails from the Illinois Steel Company and 1,000 tons from the Cambria Steel Company. This is the total order placed for next year's requirements and includes the order for 15,000 tons reported in these columns on October 8.

SIGNALING

The Imperial Government Railways of Japan have given the Hall Switch & Signal Company an order for 42 two-arm signals with necessary relays, lightning arresters, etc.

Women Railway Workers in England.—Fred W. West, goods superintendent for the London district of the South-Eastern & Chatham Railway, has recently written informatively on the reorganization of the staff that was inevitable as the result of the large percentage of the experienced employees of all grades "loyally responding" to Lord Kitchener's call for more men. In regard to the employment of women, Mr. West says it would be unreasonable to expect either any young woman or any young man without previous experience adequately to replace men of experience in a business involving so much training and technical knowledge as the railway, consequently it was considered good, if not quite as economical, when it was found that three untrained girls could fairly undertake two trained men's duties. It seemed that what they lacked in experience they gained in enthusiasm, and there is no reason to doubt that if they apply themselves to the cult of the railway with the same pertinacity and thoroughness that they are showing at present they will quickly become very proficient. Mr. West adds:—"Women, as well as men, will learn after this war is over, if not before, that there is a dignity in what is known as 'manual labour,' never previously fully realized, and, further, that Nature no more intended woman to be inactive in winning the necessaries of life than the lioness."—*Railway Gazette, London.*

Supply Trade News

Joseph G. Crane, eastern railway representative of the Lowe Brothers Company, Dayton, Ohio, has moved his office from 54 Hudson street, Jersey City, N. J., to 101 Park avenue, New York City.

The Sharon (Pa.) plant of the American Steel Foundries started molding this week. This is the last of the company's plants to reopen to meet the pressing demands of the present revival of business.

E. H. Poetler, assistant traffic manager of the Barrett Manufacturing Company, with office at Chicago, has been appointed to a new position in charge of the railway sales department, with office at New York, N. Y.

Frederic H. Poor, who since the incorporation in December, 1909, of the S. K. F. Ball Bearing Company, of New York, has been its general manager, has recently severed his connection with that organization, and has opened an office of his own at 30 Church street, New York.

L. J. Hotchkiss, recently with Bates & Rogers, contractors, Chicago, has opened an office as consulting civil engineer, Monadnock Block, Chicago, and will specialize in construction layouts. Mr. Hotchkiss was formerly assistant bridge engineer of the Chicago, Burlington & Quincy.

On November 16, Judge Hazel in the United States Court for the Western district of New York, signed an order fixing December 7, 1915, as the time for a hearing on the application of the Safety Car Heating & Lighting Company, New York, for an injunction against the ampere-hour meter control system of car lighting under the Creveling patent No. 747686.

The S. K. F. Ball Bearing Company, of Hartford, Conn., recently incorporated with a capital of $2,000,000, to take over the business of the S. K. F. Ball Bearing Company, of New York, a house importing ball bearings made in Sweden, is about to erect a factory at Hartford, Conn. The new company has acquired the right to manufacture the S. K. F. ball bearings, formerly made in Sweden. Its directors are: Frank A. Vanderlip, of the National City Bank; B. M. W. Hanson, vice-president of Pratt & Whitney; Franklin B. Kirkbride, 7 Wall street, New York; A. Carlander and S. Winguist, directors of the Swedish S. K. F. Company, which is a large holder in the new American corporation, and B. G. Prytz, who will act as president.

J. Leonard Replogle, vice-president and general manager of sales of the American Vanadium Company since March 1, 1915, and prior to that vice-president and general manager of sales of the Cambria Steel Company, on November 12 purchased from the Pennsylvania company approximately 240,000 shares of stock in the Cambria Company at a price of almost $15,000,000. He is acting, it is understood, for a syndicate, composed, among others, of E. T. Stotsbury of Drexel & Co., Philadelphia, and A. W. Mellon and R. B. Bellon of the Mellon National Bank of Pittsburgh, who are buying for purposes of investment. Mr. Replogle's holdings do not give him control of the Cambria Steel Company. The latter is capitalized at $50,000,000, of which $45,000,000 is outstanding in shares of $50 par value. The Pennsylvania Company (Pennsylvania Lines west of Pittsburgh, a short time ago held $22,504,000 of this, or slightly over 51 per cent. It later sold 98,000 shares in the open market and recently William H. Donner, president of the Pennsylvania and Cambria Steel Companies, exercised options for the purchase of 112,000 shares. Mr. Donner was negotiating for an option on or for the purchase of the remainder of the Pennsylvania Company's holds, when Mr. Replogle also made an offer. It is understood that the syndicate for which Mr. Replogle is acting controls more than the 240,000 shares acquired from the Pennsylvania Company, but it is not believed that they have a majority control. Mr. Donner and H. C. Frick had been taking action leading to a possible merger of the Pennsylvania and Cambria Steel Companies. Whether this will now be carried out is a question. The *Railway Age Gazette* printed a photograph and sketch of Mr. Replogle in the issue of February 5, 1915, page 249.

TRADE PUBLICATIONS

CONDENSERS.—The Mesta Machine Company, Pittsburgh, Pa., has recently issued Bulletin R, dealing with the Mesta barometric condensers made by that company.

FLORIDA EAST COAST.—The passenger department of the Florida East Coast has recently issued an especially attractive illustrated booklet, describing the hotels and resorts of the state of Florida.

STORAGE BATTERIES.—Bulletin No. 12, recently issued by the General Lead Batteries Company, Newark, N. J., deals with the use of the hydrometer syringe made by that company and tells how to recharge batteries.

CAR DOOR FASTENERS.—Circular No. 54, recently issued by the National Malleable Castings Company, Cleveland, Ohio, describes and illustrates the company's line of National safety car door fasteners, handles, stops and fittings.

FLOORING.—The Standard Asphalt & Rubber Company, Chicago, has issued a 24-page pamphlet containing 42 photographs showing installations of Sarco mineral rubber floors and waterproofing in buildings and other structures.

LUMBER.—The Gum Lumber Manufacturers' Association, Memphis, Tenn., has recently issued a booklet containing technical information about red gum. A number of illustrations are given, for the purpose of showing the graining and other characteristics.

BULB SECTIONS.—The Carnegie Steel Company, Pittsburgh, has issued a pamphlet containing tables and data on all the sections which they now roll in bulb angles and bulb beams. This is in response to an increased demand for this class of material for use in steel car construction and particularly for steel ship building in the United States and elsewhere.

WATERPROOFING EXPOSED WALLS.—The Minwax Company, New York City, has issued bulletin No. 2 of the series of pamphlets on the subject of waterproofing. This issue deals with the waterproofing of exposed walls, both with Minwax clear waterproofing for external use and Minwax damp-proofing for internal use. The bulletin also contains specifications for these materials and photographs of a number of buildings in which these materials have been used.

WATER LIFTED BY COMPRESSED AIR.—The Ingersoll-Rand Company, New York City, has published an 80-page pamphlet describing the air lift pump and its advantages for various purposes in connection with underground waters. The principles of the air lift system of pumping are explained and a description is given of the equipment required, including four pages cataloguing the Ingersoll-Rand standard steam-driven air compressors suitable in connection with this work. There are also eight pages of tables on friction of pipes and other data of value in connection with the handling of water by means of compressed air.

STEEL SHEET PILING, TENTH EDITION.—The Carnegie Steel Company, Pittsburgh, Pa., has just issued a pamphlet superseding a previous edition published in 1912, which describes steel sheet piling for use in cofferdam construction, retaining walls and similar work. The pamphlet contains the necessary data relative to the sections and much information concerning their various uses and the operations connected with the application of these plans. It also contains a general discussion of earth and water pressures and the computation of bracing systems for cofferdams, retaining walls, etc., and information on the weights of materials, strength of hoisting ropes, capacity of tackles, concrete, bearing power of piles, etc., which would be of value to foundation engineers.

DRILLS.—The Ingersoll-Rand Company, New York City, has issued a 128-page pamphlet on the subject of core drilling, which is a comprehensive treatise on the subject. It explains the value of cores in determining the character, order, thickness and extent of materials below the earth's surface, differentiates between diamond drill and the Calyx drill, and describes in detail the equipment necessary for this purpose, with particular reference to the bits. This is followed by a discussion of construction methods and results obtained. Thirty-one pages are devoted to descriptions of the complete core drill plants of various styles and sizes manufactured by the Ingersoll-Rand Company.

Railway Construction

Boyne City, Gaylord & Alpena.—An extension is projected from a point east of Atlanta, Mich., towards Alpena, nine miles.

Cape Breton.—Surveys have been made to build an extension from St. Peters, N. S., northeast to Sydney, 60 miles. The company now operates a 31-mile line from St. Peters west to Point Tupper.

Central of Oregon.—This company's plans call for building 77 miles between Union, Ore., and Walla Walla, Wash., also a branch from Union to Medical Springs, 22 miles. The company now operates 18 miles from Union Junction east to Union, thence north to Cove, also a branch from Union west to Hot Lake, eight miles.

Champlain & Sanford.—This company plans to build a line from Sanford Lake, N. Y., east to Fort Ticonderoga, about 60 miles. Most of the right of way has been secured, but actual work has not yet been started. E. Scharson, president, 71 Broadway, New York. (See New York Roads, March 26, p. 720.)

Colorado, Wyoming & Eastern.—Surveys have been made for building a new line from the existing line at North Gate, Colo., southwest to Hayden, 90 miles. The company now operates a line from Laramie, Wyo., west to Centennial, thence south via North Gate, Colo., to Coalmont, 111.1 miles.

Gulf Coast Railway.—Incorporated in Florida to build from Venice, Fla., southeast to Placida, 22 miles. This is the line proposed by the Southern Investment Company. The incorporators include L. M. Williams and S. H. Bemiss, Richmond, Va., and T. C. Williams, Sarasota, Fla. (See Florida Roads, July 16, p. 143.)

Kent Northern.—This company plans to build a 42-mile line, from Kent Junction, N. B., southwest to Chipman, about 50 miles. Surveys are now being made. The company operates a 27-mile line from Kent Junction, where a connection is made with the Intercolonial east to Richibucto.

New York Subways.—The New York Public Service Commission, First district, is asking for bids for the construction of two sections of the Dual System of rapid transit in the City of New York. Bids are to be opened on November 30 for Section No. 2 of Routes Nos. 19 and 22, being the elevated extension of the Southern boulevard and Westchester avenue branch of the Lexington avenue subway, extending northerly over Westchester avenue, the Bronx, from a point near the intersection of Whitlock avenue to Pelham Bay Park. Bids are to be opened on December 7 for the construction of Section No. 3 of Route No. 8, comprising the tunnel section under the East river from Fourteenth street in the borough of Manhattan to North Seventh street in the borough of Brooklyn. Route No. 8 will extend from Sixth avenue, Manhattan, to North Seventh street in the borough of Brooklyn, thence through various streets and private property to a connection with the Broadway elevated line.

The commission has given a contract to Murphy Brothers, Brooklyn, the lowest bidder at $7,421, for the construction of the storm drain for the Queensboro subway in the borough of Queens. This subway is now being operated between the borough of Manhattan and Long Island City. It is to be extended on the Queens side to the Queensboro bridge plaza and to a connection with the Astoria and Corona elevated railroads. Bids have been received by the commission for the installation of tracks on the Queensboro subway extension, the Astoria elevated line and the Corona elevated line. George S. Bennett, who offered to do the work for $204,000, was the lowest bidder.

Pacific Great Eastern.—President J. W. Stewart of this company, which is building from Vancouver, B. C., north to Prince George, 480 miles, is quoted as saying that satisfactory progress has been made on the construction of the main line. The grading of the entire line is finished except on the Howe Sound section between Horseshoe Bay and Squamish, about 30 miles, and about 30 miles of light work near Horse Lake. During the past year track has been extended north of Squamish to a point some miles beyond Lillooet, and the contractor is now operating train service between these towns under an agreement with the company. He is also maintaining train service on the North Vancouver-Horseshoe Bay section. Track-laying work is now under way. (July 16, p. 143.)

Piedmont & Northern (Electric).—A contract has been given to the Charlotte Grading Company, Charlotte, N. C., and work is now under way on the branch line from Belmont Junction, N. C., to Belmont, about 4 miles. The work will be light and involves handling 10,000 cu. yd. to the mile. The maximum grade will be 3 per cent and the maximum curvature 13 deg. The company expects to develop on the branch a traffic in cotton factory products, cotton and coal. (November 12, p. 923.)

Salt Lake & Utah (Electric).—This railroad has awarded the contract for grading an extension from Spanish Fork, Utah, to Payson to the Wasatch Grading Company. The approximate fill per mile will be 10,000 cu. yd., the maximum grade about 1 per cent and the maximum curvature 4 deg. Grading has just been begun, and the track laying will be done by company forces. The company will also construct the three short ballast-deck timber trestles found necessary in the survey. The extension will be six miles long. W. R. Armstrong, general manager and chief engineer, Salt Lake City, Utah.

Spanish Peak Lumber Company, Quincy, Cal.—This company has awarded a contract to the United States Steel Products Company for a tramway from Spanish Ranch to Gray's Flat, about six miles. The contract price is about $36,000.

Williamsport, Nessle & Martinsburg.—Work is now under way on the section from Nessle, W. Va., to Cherry Hill, two miles. The work is being carried out with company forces. The plans call for a line from Williamsport to Martinsburg, 15 miles. Surveys have been made. John Carmichael, president, Hagerstown, Md. (August 27, p. 409.)

RAILWAY STRUCTURES

Belmont, N. C.—The Piedmont & Northern will build a combined freight and passenger station, to be of brick construction, at Belmont. See this company under Railway Construction.

Brooklyn, N. Y.—The New York Public Service Commission, First district, has given a contract to A. L. Guidone & Son, Incorporated, the lowest bidder at $513,656, for the construction of station finish on Section No. 2 of Route No. 39. This work is on the New Utrecht avenue elevated railroad in the borough of Brooklyn. The steel structure for this section is nearing completion.

Macon, Ga.—The general contract has been given to J. Henry Miller, Inc., Baltimore, Md., for building the union station at Macon. The new station is to be of stone, brick and steel construction and is to cost about $500,000. It will be used jointly by the Central of Georgia, the Southern Railway and the Georgia Southern & Florida. (September 24, p. 586.)

Mexia, Tex.—The Houston & Texas Central has begun work on a new station, one story in height, 25 ft. wide and 123 ft. long. It will be a brick structure with asbestos shingle roof, and will cost about $9,500. About 5 per cent of the work has been completed. F. T. Jeans, superintendent bridges and buildings, Ennis, Tex.

Milwaukee, Wis.—The Chicago & Milwaukee Electric is building a bridge over the Chicago, Milwaukee & St. Paul tracks just south of the city. It will consist of a 185-ft. skew through girder span, a 140-ft. truss span and a 55-ft. skew deck girder span. Concrete abutments and piers have been built by company forces and the contract for the steel work has been let to the Wisconsin Bridge & Iron Company. (Noted under Iron and Steel, October 15.)

Mount Vernon, N. Y.—Plans have been agreed upon by all interested for a six-span concrete viaduct connecting Broad street, Mount Vernon, with Vermont avenue, Yonkers, over the tracks of the New York Central and over the Bronx river. The Public Service Commission is expected to issue the necessary order in the near future. This viaduct will cost about $80,000.

Railway Financial News

ATCHISON, TOPEKA & SANTA FE.—Ogden Mills, of New York, has been elected a director, succeeding Thomas P. Fowler, deceased.

CINCINNATI, INDIANAPOLIS & WESTERN.—The Ohio Public Service Commission has approved of the issue of $2,675,000 first mortgage 5 per cent 50-year bonds, $5,350,000 6 per cent non-cumulative preferred stock and $5,350,000 common stock by the new company, the Cincinnati, Indianapolis & Western Railroad, which bought at foreclosure sale the Cincinnati, Indianapolis & Western Railway, a subsidiary of the Cincinnati, Hamilton & Dayton. The old company operated 381 miles of road, of which 361 miles was owned.

CHICAGO, ROCK ISLAND & PACIFIC.—The following is a summary of the report of J. W. Kendrick, who has been employed to make an estimate of the needs of the property. His report is in regard to a period of five years:

The full amount of the savings or economies suggested will not be realized until the last year, that is the year ending June 30, 1921. The major part of the capital expenditures should be made during the first three years or up to June 30, 1919, and the money so required is estimated to be $27,000,000, divided among the various accounts as follows:

ESTIMATED CAPITAL EXPENDITURES TO JUNE 30, 1919.

Grade revision, new lines, sidings and second track	$ 6,008,000
New freight locomotives	1,000,000
Improvements to existing equipment—cars and engines	3,442,000
Rails	750,000
Ballast and bank widening	3,587,000
Tie plates	3,000,000
Yards and terminals	2,207,000
Track motor cars	176,000
Bridges	280,000
Track elevation and grade separation	3,392,000
Fences	309,000
Telegraph and telephone	275,000
Signals	291,000
Miscellaneous	2,487,000
Total	$27,204,000

It is believed that this amount of money, judiciously expended, will result in putting the Rock Island in good physical condition and by the exercise of close supervision it is estimated that the net annual saving in operating expenses for the fiscal year ending June 30, 1919, will amount to about $5,050,000. Four thousand freight cars have been purchased by the receiver and by the expenditures recommended in connection with the equipment reinforcement and betterment, some 5,000 additional fright cars will be put into serviceable condition and will result in an estimated reduction in hire of equipment charges amounting to $700,000 per annum. By the cancellation and modification of certain leases there should also be a reduction in rentals amounting to $319,000. The expenditures will cause an increase in interest on funded and unfunded debt in 1919 over 1915 of $1,588,000.

Applying these estimates to the year ending June 30, 1919, and assuming that the gross operating revenue increases at the same rate it has during the past five years, the income account for the year ending June 30, 1919, will be as follows:

INCOME ACCOUNT 1919.

Railway operating revenue		$74,550,000
Operating expenses		50,918,000
Operating ratio, per cent		68.3%
Net revenue from railway operation		23,632,000
Taxes and uncollectible revenue		3,986,000
Total railway operating income		19,646,000
Other income		1,368,000
Total income		21,014,000
Hire of equipment, Dr.	$ 556,000	
Rent of other equipment	453,000	
Joint facilities and other rents	1,304,000	
Rent for leased roads	332,000	
Interest on funded and unfunded debt	13,724,000	
Other income charges	342,000	
Total deductions		16,711,000
Balance of income		$ 4,303,000

During 1920 and 1921 $4,000,000 should be expended annually for additions and betterments and by the end of the fiscal year 1921 it is believed all of the estimated economies should be realized. On this basis the operating ratio for 1921 will be 64.1 per cent and the income account will be as follows:

INCOME ACCOUNT 1921.

Railway operating revenue		$76,350,000
Operating expenses		48,940,000
Operating ratio, per cent		64.1%
Net revenue from railway operation		27,410,000
Taxes and uncollectible revenue		4,286,000
Total railway operating income		23,124,000
Other income		1,368,000
Total income		24,492,000
Hire of equipment, Dr.	$ 556,000	
Rent of other equipment	453,000	
Joint facilities and other rents	1,304,000	
Rent for leased roads	332,000	
Interest on funded and unfunded debt	14,124,000	
Other income charges	342,000	
Total deductions		17,111,000
Balance of income		$ 7,381,000

See also Trinity & Brazos Valley.

COLORADO & SOUTHERN.—See Trinity & Brazos Valley.

KANSAS CITY, OZARK & SOUTHERN.—The receiver has fixed November 18 for the winding up of the receiver's affairs, some time after which a reorganized company will take over the property.

NEW ORLEANS, TEXAS & MEXICO.—This former subsidiary of the St. Louis & San Francisco was sold at public auction on November 15 to Walter L. Taylor, representing the bondholders' protective committee, for $6,000,000.

NEW YORK, NEW HAVEN & HARTFORD.—F. T. Maxwell has been elected a member of the executive committee of the New York, New Haven & Hartford, succeeding H. K. McHarg.

PENNSYLVANIA.—It is announced that this company has sold the balance of its holdings, said to be about 240,000 shares, of Cambria steel stock. Cambria steel has been selling in the open market between $65 and $70 per share.

SOUTHERN PACIFIC.—F. D. Underwood, president of the Erie, has been elected a director of the Southern Pacific, succeeding C. N. Bliss, resigned. Announcement was made that this change had nothing to do with any traffic relations between the Erie and Southern Pacific but was the result of a desire on the part of the Southern Pacific to secure as a director one of the ablest operating officers in the country.

ST. LOUIS & SAN FRANCISCO.—Representatives of the reorganization committees under the receivers have submitted to the Missouri Public Service Commission an outline of the plan of reorganization of the St. Louis & San Franicsco. The reorganization managers are Speyer & Co. and J. & W. Seligman & Co., both of New York. The mileage to be taken over by the new company totals 5,155; the total capitalization is to be $327,211,188, as against the present total capitalization of $356,890,056; the fixed and contingent charges of the new company will be $13,524,119, or a reduction of 47.64 per cent as compared with the present fixed charges. An assessment of $50 a share is to be made on stockholders of the old company, who have the privilege, however, of paying $5 in cash and paying the remaining $45 in 18 months. Stockholders are to receive for their assessment and surrender of old stock 85 per cent in new stock and $50 in first mortgage bonds.

See also New Orleans, Texas & Mexico.

TRINITY & BRAZOS VALLEY.—A correspondent at Houston, Tex., writes that Louis W. Hill and other officers of the Great Northern and the Chicago, Burlington & Quincy, which latter road controls the Colorado & Southern, made an inspection trip over the Trinity & Brazos Valley in the process of negotiations for taking over the half interest formerly held by the Chicago, Rock Island & Pacific (the other half interest now being held by the Colorado & Southern) in this property.

FORTY THOUSAND DOGS.—The Baltimore & Ohio reports that the transportation of hunting and pet dogs was a source of $10,000 revenue to the road last year, according to the records of the baggage department; 40,000 dogs at 25 cents each; and all were handled without a claim for loss or injury.

[ADVERTISEMENT]

ANNUAL REPORT

BALTIMORE AND OHIO RAILROAD COMPANY—EIGHTY-NINTH ANNUAL REPORT

Office of the Baltimore & Ohio Railroad Company.

BALTIMORE, Md., October 27, 1915.

To the Stockholders of the Baltimore & Ohio Railroad Company:

The president and directors of the company submit herewith report of the affairs of the company for the fiscal year ended June 30, 1915.

Except where otherwise indicated, the comparisons shown herein are with the figures for the preceding fiscal year. The income and capital accounts for the year are stated in accordance with the new accounting classifications as prescribed by the Interstate Commerce Commission, effective July 1, 1914, and in order that such comparisons may be properly made, the figures for the preceding year have been recast, so far as practicable, and consequently do not agree in detail with the figures published in the last annual report.

MILEAGE AND EQUIPMENT.

The statements in this report show the results of the operation of the lines directly controlled and operated by your company, embracing:

	First Main Track.	Total of All Tracks.
Miles (owned)	4,458.97	8,803.17
Miles (trackage rights)	76.30	204.10
Total miles operated	4,535.27	9,007.27

as shown in Table 28.

There has been an increase during the year in total first main track mileage operated of 57.05 miles, which was occasioned by the acquisition of the Moorefield and Virginia Branch, 36.61 miles; the construction of the Magnolia Cut-off, 13.14 miles; the extension of branch lines, 5.34 miles, and certain other adjustments, 1.96 miles.

The equipment of the company at June 30, 1915, consisted of 2,399 locomotives, 1,261 passenger cars, 86,097 freight cars, 3,163 work cars and 144 pieces of floating equipment, as shown in detail in Table 27.

RESULTS FROM OPERATION.

The general income account of the company will be found in Table 1.

The total railway operating revenues were $91,815,797.34, a decrease of $7,348,212.63, or 7.41 per cent.

The total railway operating expenses were $63,925,507.74, a decrease of $10,477,880.78, or 14.08 per cent.

The ratio of operating expenses to total revenues was 69.62 per cent., compared with 75.03 per cent. for the previous year.

The net revenue from railway operations was $27,890,289.60, an increase of $3,129,668.15, or 12.64 per cent.

The gross income from the year's operations was sufficient to enable your company to meet its fixed and other charges, to pay the established four per cent. dividend upon the preferred stock and five per cent. upon the common stock, and leave a surplus of $771,473.86.

FREIGHT REVENUES AND STATISTICS.

Freight revenue was $70,780,808.51, a decrease of $5,617,908.11, or 7.35 per cent., and constituted 77.09 per cent. of total railway operating revenues, as against 77.04 per cent. last year.

The Interstate Commerce Commission has ordered, effective July 1, 1914, that all statistics, with respect to tons and tonnage, be adjusted to the basis of 2,000 pounds per ton, without regard to the customary weight of the ton as waybilled. The statistics heretofore published have been on the basis of the weight of the ton as waybilled, and as a large proportion of your company's tonnage is waybilled at 2,240 pounds to the ton, as prescribed by tariffs, the effect of the recent requirements of the commission is to materially increase the number of tons as reported. The traffic statistics, Table 12 and Table 13-A, for the years 1915 and 1914, are given on the new basis, but in order that comparisons for the ten-year period may be continued, the statistics given in Table 13-B are stated on the basis of the tons as waybilled.

The tons of revenue freight carried were 64,375,595, a decrease of 7,891,465 tons, or 10.92 per cent., and the tons carried one mile were 12,970,894,074, a decrease of 1,083,527,427 tons, or 7.71 per cent. As indicating the traffic density of the system the revenue ton miles per mile of road were 2,860,005 tons, a decrease of 252,534 tons,, or 8.11 per cent. The average distance each ton was carried was 201 49-100 miles, a gain of 7 1-100 miles over the previous year. Freight revenue per mile of road was $15,606.75, a decrease of $1,312.77, or 7.76 per cent., and the revenue per freight train mile was $3.77 81-100, an increase of 26 99-100 cents, or 7.69 per cent. The average earnings per ton per mile were 5 46-100 mills, an increase of 2-100 mills. The increase in the average rate per ton per mile, and in the average distance each ton was carried is mainly due to a larger proportion of the coal shipments being consigned to the ports of Baltimore and New York. Freight traffic statistics are given in Tables 12 and 13.

The statement of commodities carried, Table 14, shows a substantial increase in the grouping of products of agriculture of 668,164 tons, or 18.97 per cent. There was, however, a very large decrease in the items comprised in the grouping of products of mines, amounting to 7,520,045 tons, or 15.42 per cent. under the previous year. The decrease in Products of Mines and of Manufactures reflects the depression in the steel trade and allied industries throughout the greater part of the year.

PASSENGER REVENUES AND STATISTICS.

Passenger revenue amounted to $14,059,940.41, a decrease of $1,830,050.54, or 11.52 per cent. These earnings constitute 15.31 per cent. of total earnings, compared with 16.02 per cent. for last year.

The number of passengers carried was 20,581,992, a decrease of 2,166,078, or 9.52 per cent.; the number of passengers carried one mile was 714,368,423, a decrease of 112,910,193, or 13.65 per cent., and the average distance each passenger was carried was 34.71 miles, a decrease of 1 66-100 miles. Of the decrease in passenger earnings, approximately $800,000 was due to the cessation of immigrant business occasioned by the disturbed conditions in Europe, and the remaining portion of the decrease reflects the general depression in business. The average rate per passenger per mile for the year was 1 968-1000 cents, an increase over the previous year of 47-1000 cents, due in part to the withdrawal of special rate features and the increase in certain fares. The average earnings from each passenger decreased 1 54-100 cents. These and other statistics relating to passenger traffic will be found in Tables 10 and 11.

MISCELLANEOUS REVENUES.

Mail revenue was $1,236,076.68, an increase of $21,733.61 over the preceding year.

Express revenue was $1,818,452.68, a decrease of $31,761.15. That this decrease was not greater in a year of general depression, is due largely to the earnest co-operation and great activity displayed by the Wells Fargo Express Company in building up this branch of the service.

Other transportation revenue, in which is included earnings from switching and special train service, transportation of milk, excess baggage, water transfers, etc., shows a net decrease of $44,338.20, mainly from excess baggage charges and water transfers.

Revenue from sources other than transportation, in which is included earnings from dining cars, station privileges, storage, grain elevators, joint facilities, etc., shows a net increase of $154,111.76, principally occasioned by the increase in earnings from elevators, due to the larger movement of grain.

OPERATING EXPENSES.

The total operating expenses for the year were $63,925,507.74, compared with $74,403,388.52 for last year, a decrease of $10,477,880.78, or 14.08 per cent.

The total maintenance of way and structures expenses were $8,985,626.86, a decrease of $3,432,808.11, or 27.64 per cent. It should be noted in this connection that maintenance of way expenses for the previous year included a charge of $2,112,084.98 directly attributable to the disastrous floods of March, 1913, which had no counterpart in the operations of the present fiscal year. These expenses include $556,452.15, covering replacement and revision of facilities incident to additions and betterments. The roadway and structures have been properly maintained.

The total maintenance of equipment expenses were $16,002,588.53, a decrease of $1,147,186.68, or 6.69 per cent. Included in these expenses is a charge for depreciation of equipment amounting to $2,810,415.80.

The total of all maintenance expenses for the year was $24,988,215.39, and compared with the same expenses for the preceding year shows a decrease of $4,579,994.79, or 15.49 per cent. These expenses for the year represent 27.22 per cent. of total operating revenues, as compared with 29.82 per cent. the preceding year.

The total transportation expenses for the year were $34,254,572.05 and, compared with last year $39,985,496.44, show a decrease of $5,730,924.39, or 14.33 per cent. These expenses were 37.31 per cent. of total operating revenues, as compared with 40.32 per cent. the preceding year. Co-incident with the decrease in transportation costs and directly contributing thereto was the heavier freight train load, which was 692.35 tons this year against 645.37 tons for the previous year, an increase of 46.98 tons, or 7.28 per cent. There was a decrease in revenue freight train miles of 3,042,622 miles, or 13.97 per cent., notwithstanding the revenue freight handled one mile decreased but 7.71 per cent.

The traffic expenses decreased $247,329.82, or 11.49 per cent., due mainly to less expenditure for outside agencies and for printing tariffs, etc.

The Interstate Commerce Commission classification of outside operations was abolished, effective July 1, 1914. The greater portion of the expenses formerly charged to those accounts are now charged direct to other accounts; a minor portion, however, is still segregated and included in miscellaneous operations, and the fluctuations therein for the year were immaterial.

The general expenses increased $92,664.23, due, principally, to increased expense of the relief department on account of increase in pension payments and to the difference in method of charging appropriations made to that department.

The credit item of transportation for investment is a new requirement of the Interstate Commerce Commission. The amount included therein represents the reasonable cost of transporting men and material for construction work and is charged to the cost of such work.

TAXES.

Railway tax accruals amounted to $3,289,611.04, and taxes charged to miscellaneous tax accruals amounted to $213,463.32, or a total of all taxes for the year of $3,503,074.36, an increase of $59,926.33. Taxes for the year were 3.82 per cent. of total operating revenues.

INCOME ACCOUNT.

Nonoperating income, in which is included rentals from property and equipment, dividends and interest on securities owned, etc., decreased $872,569.82, due to the exclusion from the income of the year of any interest accruing on obligations of the Cincinnati, Hamilton & Dayton Railway Company now held by your company.

Deductions from gross income, in which is included rentals paid for the use of equipment and property, interest on funded and unfunded debt, etc., increased $654,529.68, occasioned by increase in certain rentals paid and larger interest charges incident to increased capital obligations.

The net income for the year amounted to $10,780,881.33, an increase of $1,530,856.95 over the preceding year, out of which dividends at the rate of four per cent. per annum were paid on the preferred stock of the company, amounting to $2,354,521.28. After deducting this amount and required appropriations for sinking and other reserve funds, the balance transferred to profit and loss was $8,368,727.07.

PROFIT AND LOSS.

The amount to the credit of profit and loss at the beginning of the fiscal year was $32,804,187.74, which amount was increased to $41,172,914.81 by the addition of the surplus income earned during the year as shown above. Dividends at the rate of five per cent. per annum, amounting to $7,597,253.21, were declared on the common stock of the company and charged to profit and loss, and there was also charged to this account during the year the net amount of $1,000,147.69, included in which is $897,970.95 for discount and expenses on securities sold during the same period. The balance to the credit of profit and loss, which represents the excess book value of assets over liabilities, at the close of the year is $32,575,513.91.

THE FIVE PER CENT. RATE CASE.

Because of the steady and constant increase in the costs of operation due to matters of a continuing character, such as wage increases, legislative requirements, and the necessity of maintaining higher standards in maintenance and operation, there had been a marked decline in the rate of return in net operating income upon the property investment of the railroads generally during the past several years. Owing to the inadequacy, under these conditions, of the then existing rates, your company joined with other railroads serving official classification territory in proceedings before the Interstate Commerce Commission, seeking to secure approval of a uniform advance in freight rates of five per cent.

Following the original and supplemental petitions of the railroads in the matter, and after hearings and investigations extending over more than a year, the Interstate Commerce Commission, in December, 1914, approved an advance in the freight rates in the so-called official classification territory, which includes the territory served by your company, of approximately five per cent., except on certain commodities such as bituminous and anthracite coal, coke, iron ore, etc., and on traffic moving via lake and rail, which exceptions apply to about one-half of the freight traffic of your company. The Commission also approved of advances in certain passenger rates and some other miscellaneous charges. The revised

rates on interstate traffic became effective generally in March, 1915, but the application for authority to adjust interstate rates is still pending in some of the States; therefore, the full effect on your company's revenues cannot now be determined.

In that part of the decision devoted to their findings as to the adequacy of present revenues, the Commission, among other things, stated:

> "In view of a tendency towards a diminishing net operating income as shown by the facts described we are of opinion that the net operating income of the railroads in official classification territory, taken as a whole, is smaller than is demanded in the interest of both the general public and the railroads; and it is our duty and our purpose to aid, so far as we legally may, in the solution of the problem as to the course that the carriers may pursue to meet the situation."

While granting approximately only one-half of the immediate relief asked for by the railroads, it should be encouraging to those interested in railroads and in the proper industrial development of this country to know that the Commission treated the question before it in a broad way, and recognized, unanimously, the necessities of the carriers for additional revenues and declared its purpose to aid, so far as it legally may, in the solution of the problem as to the course that the carriers may pursue to meet the situation. It is believed that the inquiry has also served to bring about a much better understanding of the railroad situation by all interested or concerned in that question, and that because of this clearer understanding the shippers, the railroads and the regulatory agencies of the public will all in the future be better able to satisfactorily work out the many problems incident to the governmental regulation of the public utilities.

CHANGES IN CORPORATE RELATIONS.

Continuing the programme begun in 1912 for the purpose of simplifying the title to properties underlying the several System mortgages and of reducing the number of corporate entities comprising the System, thereby affording a more comprehensive basis for future financing, The Baltimore and Ohio Railroad Company during the year acquired the fee title to the property of the following corporations owning railroads in the State of Ohio, the operations of which properties are included in the System's income account as heretofore, viz.:

The Central Ohio Railroad Company, as reorganized.	142.72 miles
Sandusky, Mansfield and Newark Railroad Company, as reorganized	116.25 "
The Columbus and Cincinnati Midland Railroad Company	69.80 "
The Ohio Midland Railroad Company	43.86 "
The Cleveland, Loraine and Wheeling Railway Company	191.14 "
The Pittsburgh, Painesville and Fairport Railway Company	49.86 "
The Trumbull and Mahoning Railroad Company	8.64 "
The Mahoning Valley Western Railway Company	43.07 "
The Eastern Ohio Railroad Company	16.90 "
The Akron and Chicago Junction Railroad Company.	77.30 "
The Cleveland, Wooster and Muskingum Valley Railroad Company	35.73 "
The Pittsburgh, Cleveland and Toledo Railroad Company	36.81 "
	832.08 miles.

The fee of that portion of The Pittsburgh, Cleveland and Toledo Railroad Company, lying wholly within the State of Pennsylvania, 9.85 miles, was acquired by The Pittsburg and Western Railroad Company, the entire capital stock of the latter being owned by your Company.

The Baltimore and Ohio Railroad Company also acquired the fee title to the property formerly owned by the Moorefield and Virginia Railroad Company, 36.61 miles, which had heretofore been operated separately, but was included in the operations of the System for the fiscal year.

The purchase price of these properties represented the investment of your Company in the securities of, and capital advances to, the corporations mentioned above at the time of acquisition. The total amount of your investment has not been changed by reason of such purchases, the effect being merely to alter the form of the investment and to simplify the accounts on the general books of the Company.

The purchase of these properties, except in the case of the Moorefields and Virginia Railroad Company, did not increase or change the miles of road of the System, but did, however, increase the miles of road owned in fee by The Baltimore and Ohio Railroad Company to the extent of 868.69 miles. The length of road now owned in fee is 2,188.75 miles, or 49.13 per cent. of the mileage comprising the System.

GENERAL BALANCE SHEET.

The general balance sheet, stated generally in the form now prescribed by the Interstate Commerce Commission, is shown in Table 2, and the principal differences in the assets and liabilities of the Company, as compared with the previous year, are as follows:

ASSETS.

The grouping of investments, in which is included the capital assets of the Company, shows an increase for the year of ..... $9,195,985.07 made up as follows, viz.:

Net charge to road	$6,538,144.22
Net charge to equipment	2,082.090.69
Miscellaneous investments (net)	575,750.16
	$9,195,985.07

The grouping of current assets shows a decrease of .....$24,734,033.96. Of this decrease $17,751,244.53 is in cash and is due to the inclusion last year of $20,000,000.00 in this item to pay a like amount of one-year secured notes, which matured and were paid July 1, 1914. There was a decrease in special deposits of $1,900,947.53, due to payments for additional equipment acquired for the equipment trust of 1913, and a decrease in material and supplies of $1,935,412.98. The increases in groupings of deferred assets and unadjusted debits are normal fluctuations incident to the business.

LIABILITIES.

There were no additional issues of capital stock during the year.

The grouping of long term debit, *i. e.*, funded debt shows an increase of ..... $3,991,833.34 accounted for as follows:

Obligations issued during the year—		
Four and one-half per cent. secured gold notes—		
Series "A," maturing June 1, 1917	$20,000,000.00	
Series "B," maturing June 1, 1918	20,000,000.00	
		$40,000,000.00
Issued to retire $35,000,000.00 one-year notes, matured June 1, 1915, and for other corporate purposes.		
First mortgage bonds		$1,000,000.00
Issued under provision of the mortgage, in recoupment of construction expenditures.		
Hampshire Southern R. R. Co. (Moorefield & Virginia R. R. Co.) first mortgage bonds, assumed		5,000.00
		$41,005,000.00
Obligations retired during the year—		
Baltimore & Ohio equipment trust of 1912	$1,000,000.00	
Series "C," paid at maturity.		
Baltimore & Ohio equipment trust of 1913	1,000,000.00	
Series "B," paid at maturity.		
Baltimore & Ohio R. R. Co., Loan No. 6 of 1853	6,000.00	
Purchased and retired.		
Real estate mortgages and ground liens, liquidated	7,166.66	
Baltimore & Ohio R. R. Co., one-year secured notes	35,000,000	
		37,013,166.66
Paid at maturity—June 1, 1915.		
Net increase		$3,991,833.34

Current liabilities show a decrease of .....$21,484,875.37 due, principally to the payment at maturity, July 1, 1914, of $20,000,000.00 of one-year secured notes, the balance of the decrease being in the accounts interest matured unpaid, unmatured dividends unpaid, etc.

Deferred liabilities decreased $470,620.68, resulting from the operations of the relief department and smaller aggregate amounts withheld from contractor's estimates. Unadjusted credits increased $1,407,635.80, the major portion of which represents the net increase in accrued depreciation on equipment.

Incident to the acquisition of the fee of certain properties in Ohio, there was restored to the investment account of road $2,793,197.90 of capital expenditures for additions and betterments, which had heretofore been charged to income or surplus, and this change accounts for the increase in the item additions to property through income and surplus.

EQUIPMENT TRUSTS.

The status of the equipment trusts at June 30, 1915, follows:

Baltimore & Ohio equipment trust of February, 1912:		
Total outstanding June 30, 1914	$8,000,000.00	
Matured and paid during the year—		
Series "C"—paid February 1, 1915	1,000,000.00	
Outstanding June 30, 1915		$7,000,000.00
Baltimore & Ohio equipment trust of 1913:		
Total outstanding June 30, 1914	$9,000,000.00	
Matured and paid during the year—		
Series "B"—paid April 1, 1915	1,000,000.00	
Outstanding June 30, 1915		8,000,000.00
Total equipment trust obligations outstanding June 30, 1915		$15,000,000.00

Each of these trust was issued in ten series of $1,000,000.00, one series of each trust maturing annually.

ADDITIONS TO ROAD AND EQUIPMENT.

The total expenditures charged to road account were $3,744,946.32. These charges are shown in Table 6, where they are grouped under the more important accounts of the road and equipment classification.

The total capital expenditures for equipment during the year aggregated $4,231,882.19, as shown on page 12. Table 27 shows the equipment in service and the various changes occurring therein during the year.

ROAD.

The work of constructing the roadway for new double track line and relocation of parts of the old line between Okonoko and Orleans Road, W. Va., known as the Magnoli Cut-off improvement, has been completed. One track has been laid and was put in operation December 6, 1914. The laying of the second track has been held in abeyance. With the use of this improvement it has been possible to increase the eastbound slow freight train load to 6,180 gross tons, an increase of 36.36 per cent. The operations in this territory have been greatly facilitated by this improvement, the distance has been shortened 5.78 miles and the helper station at Hansrote has been eliminated, which latter constituted a serious interference with the movement of traffic by reason of eastbound trains requiring assistance over a section of the road where traffic is of the greatest density. While the new line has been opened but a little more than six months, substantial economies in transportation costs have already been effected and the movement of traffic much facilitated. With the handling of a greater volume of business the benefits derived will be proportionately larger. This improvement, together with others heretofore made, gives a continuous three-track line between Patterson Creek and Cherry Run, W. Va., a distance of 57 miles, which section has the greatest traffic density of the system, at times in excess of 24,000,000 ton miles per mile of road per annum.

No new construction work of any magnitude is now under way, but miscellaneous expenditures, as shown in detail in Table 6, were made during the year for the betterment and improvement of the property, some of the more important items were as follows:

An electric transformer station, to enable the utilization of purchased power, was erected at Camden Station, Baltimore, Md.

A new passenger station was constructed at Berkeley Springs, W. Va., and a new combination station and office building was completed at Strasburg Junction, Va.

During the year three new interlocking plants were built, and four were reconstructed and rearranged.

Automatic signals were installed over seven miles of double track, and 10.6 miles of westbound track between Orleans Road and Magnolia, W. Va. Controlled manual block signals were provided for 14.7 miles of single track, and a large number of safety devices were installed for the protection of switches, grade crossings, etc.

The alignment near Seventy-fifth street, Chicago, Ill., was corrected, eliminating 194 degrees of curvature, making it possible to operate the heaviest power on this part of the line and dispensing with a slow order over six miles of road.

The work of eliminating the grade crossing of Concord Pike, near Concord, Del., was completed, as was also the Washington Road crossing at Elkridge, Md.

The Ludlow Avenue Viaduct, Cincinnati, Ohio, which was opened for traffic on June 15, 1914, has now been entirely completed, and substantial progress has also been made in constructing the Hopple Street Viaduct in the same city.

The undergrade crossing at Twenty-eighth street, Lorain, Ohio, was completed.

Important bridges were constructed during the year over the Monongahela River at Wheeling Junction, Pa.; over Central avenue, Madisonville, Ohio, and over the Potomac River at Magnolia and Kessler, W. Va., the latter two being incident to the Magnolia Cut-off.

To permit the operation of heavier locomotives the bridges between Akron Junction and Cleveland, Ohio, have been rebuilt or strengthened so as to carry engines weighing over 220,000 pounds.

EQUIPMENT.

Total book value of equipment June 30, 1914, was		$107,756,046.72
During the year the following additions to equipment were made:		
34 locomotives, 6 passenger cars, 1,781 freight cars, and 9 work cars, and payments were made amounting to	$2,749,194.06	
And 5 passenger cars, 7,564 freight cards and 1 work car were reconstructed, involving a net charge to the equipment account of	1,482,688.13	
		4,231,882.19
		$111,987,928.91
During the year the following equipment was put out of service and credited to investment in equipment: 7 passenger cars, 3,603 freight cars, 419 work cars, 1 car float, and 1 lighter, having a book value of		2,149,791.50
Making the gross book value of equipment		$109,838,137.41
From this should be deducted:		
Accrued depreciation on equipment in service as follows:		
Amountd at credit, June 30, 1914	$15,025,071.35	
Amount charged to expenses for depreciation, year ended June 30, 1915.	2,810,415.80	
	$17,835,487.15	
Less: Charges against this account for depreciation accrued on equipment put out of service during the year	1,705,733.07	
Balance to credit of cccrued depreciation on equipment in service, June 30, 1915		16,129,754.08
Making net value of equipment June 30, 1915		$93,708,383.33

In continuation of the policy inaugurated several years ago of strengthening certain classes of equipment, during the year 7,564 freight cars were rebuilt with steel underframes and bolsters and equipped with heavy draft gear to better fit them for present operating requirements.

At the end of the year 203 locomotives, that had undergone thorough repairs, were in storage awaiting traffic development.

The percentage of steel freight cars, including cars with steel underframes and steel center sills, to the total revenue freight equipment at June 30, 1915, was 81.38 per cent., as compared with 72.77 per cent. last year and 38.83 per cent. at June 30, 1909.

Of the new equipment acquired during the year, 31 locomotives and 1,195 steel freight cars were purchased under the provisions of the Baltimore & Ohio equipment trust of 1913.

Contracts have been entered into for the purchase of 50 steel passenger cars and 2,000 all steel freight cars, to be delivered during the coming fiscal year.

RELIEF DEPARTMENT.

The railroad company assumes general charge of the relief department; furnishes office room and furniture, gives the service of its officers and employes and the use of its facilities; becomes the custodian of its funds with full responsibility therefor, and guarantees the true and faithful performance of the obligations of the department.

RELIEF FEATURE.

The total number of members of this feature is 50,591. The total payments for all benefits since the inauguration of this feature, May 1, 1880, to June 30, 1915, amount to $20,096,882.93. A statement of the operations of this feature, which provides accident, sick, and death benefits for employes, is shown on the first page of Table 26.

SAVINGS FEATURE.

This feature combines the advantages of a savings and loan association, through which employes and their immediate dependents may invest their accumulated savings, and from which they may obtain funds for the purchase of homes to be repaid through easy monthly instalments. As an incentive to employes to save the railroad company guarantees four per cent. interest on all such deposits. During the past year this feature paid to depositors $416,295.91, being five per cent. on deposits, after which there was a balance of $48,178.18 carried to the surplus account. On June 30, 1915, there were 8,937 depositors, with total deposits of $8,787,816.22, an average of $982.21. During the year 1,394 new loans were made and 541 loans were paid off, leaving in force and effect at June 30, 1915, a total of 6,114 loans, amounting to $5,536,842.22. Since the inauguration of this feature, August 1, 1882, loans to the aggregate amount of $16,326,128.72 have been made, assisting employes in acquiring real estate to this extent. A statement of the operations of this feature will be found in Table 26.

PENSION FEATURE.

Pension payments to superannuated and infirm employes constitute a special payroll and are charged to operating expenses, the total amount so charged during the year being $287,835.99.

During the year 200 names were added to the pension roll and 87 were removed by reason of death, leaving 1,036 as the total number of pensioners on June 30, 1915. The average age of pensioners at June 30, 1915, was over seventy years.

A report of the operations of the department will be distributed to members.

INDUSTRIAL DEPARTMENT.

One hundred and thirty-eight new industries, manufacturing and commercial, were located on or immediately adjacent to the line during the year, from which the company expects to derive substantial freight revenues. One hundred and thirteen side tracks were constructed; eighty-seven to newly located industries and twenty-six to industries previously located, but without side track facilities.

INSURANCE FUND.

A summary of the operations of this feature for the year ended June 30, 1915, and a statement of the assets and liabilities are shown in Table 25. The surplus in this reserve fund at June 30, 1915, was $1,503,680.30.

SUBSIDIARY LINES.

The income accounts of the following lines, the capital stock of which is owned by your company, but which are operated separately, are shown in the following exhibits, viz.:

	Miles.	Net Income.
"A" The Staten Island Railway Company	12.65	$3,180.08
"B" The Staten Island Rapid Transit Railway Company	10.89	288,044.25
"C" The Sandy Valley and Elkhorn Railway Company	30.57	77,689.92
"D" The Baltimore and Ohio Chicago Terminal Railroad Company	79.42	131,783.29
	133.53	$500,697.54

The net income of the Sandy Valley and Elkhorn Railway Company was transferred and included in the income account of The Baltimore and Ohio Railroad Company, and the balance, $423,007.62, was credited to the profit and loss accounts of the respective companies.

THE CINCINNATI, HAMILTON AND DAYTON RAILWAY CO.

This property is still in the hands of Receivers, and while plans for its reorganization are now being considered, the subject has not progressed sufficiently to justify any conclusion at this time as to the ultimate effect of the reorganization upon your Company; consequently, there is nothing to add to the full statement made in this connection in the previous annual report, except that your Company has made no further advances to or on account of the Cincinnati Company other than to pay the interest accruing during the year on the $7,500,000.00 First and Refunding Mortgage Four Per Cent Bonds outstanding and bearing the guarantee of your Company.

As previously noted, there was excluded from the income account of The Baltimore and Ohio Railroad Company for the year all interest accruing on obligations of the Cincinnati Company now held by your Company, aggregating $22,695,144, so that the full weight of any income losses from this source has been met. The capital losses cannot yet be determined and adjusted.

* * * *

The President and Directors renew their acknowledgment of the loyal and efficient services of the officers and employees during the past year.

By order of the Board,

DANIEL WILLARD,
President.

CONDENSED INCOME ACCOUNT FOR YEAR.

Total railway operating revenues, rail lines	$91,815,797.34	$7,348,212.63 Dec.
Total railway operating expenses, rail lines	63,925,507.74	10,477,880.78 Dec.
Net revenue from railway operations	$27,890,289.60	$3,129,668.15 Inc.
Percentage of expenses to earnings	69.62%	5.41% Dec.
Railway tax accruals	$3,289,611.04	$52,730.32 Inc.
Uncollectible railway revenues	18,981.38	18,981.28 Inc.
	$3,308,592.42	$71,711.70 Inc.
Railway operating income	$24,581,697.18	$3,057,956.45 Inc.
Total non-operating income	5,260,847.77	872,569.82 Dec.
Gross income	$29,842,544.95	$2,185,386.63 Inc.
Deductions from gross income	19,119,296.60	662,705.38 Inc.
Net income	10,723,248.35	1,522,681.25 Inc.
Net corporate income		$10,723,248.35
Dividend payments on preferred stock, 4%		2,354,521.28
Income Balance Transferred to Profit and Loss		$8,368,727.07
Amount to Credit of Profit and Loss, June 30, 1914	$32,804,187.74	
Less Sundry Adjustments—Net Debit Bal.	1,000,147.69	31,804,040.05
		$40,172,767.12
Dividends on Common Stock 5%		7,597,253.21
Amount to Credit of Profit and Loss, June 30, 1915		$32,575,513.91

CONDENSED GENERAL BALANCE SHEET FOR YEAR.

	1915	Increase or Decrease
ASSETS:		
Investments in Road and Equipment	$316,483,508.43	
Investment in Constituent Companies	235,067,238.24	
Other Investments	97,485,553.71	
Total Investments	$649,036,300.38	$9,195,985.07 Inc.
Current Assets — Cash, Materials and Supplies, etc	35,347,085.15	24,734,033.96 Dec.
Other Assets—Insurance Fund, Securities of our issue, etc	9,261,783.99	994,687.94 Inc.
Unadjusted Debits	1,502,953.03	551,858.11 Inc.
	$695,148,122.55	$13,991,502.84 Dec.
LIABILITIES:		
Common Stock	$152,317,468.00	
Preferred Stock	60,000,000.00	
Total Stock Issues	$212,317,468.00	
Funded Debt	$406,325,609.81	$3,991,833.34 Inc.
Total Capital Obligations	$618,643,077.81	3,991,833.34 Inc.
Current Liabilities	17,809,857.39	21,484,875.37 Dec.
Deferred Liabilities	2,811,783.17	470,620.68 Dec.
Unadjusted Credits—Accrued Depreciation, etc.	19,286,933.31	1,407,635.80 Inc.
CORPORATE SURPLUS:		
Additions to Property through Surplus	4,020,956.96	2,793,197.90 Inc.
Profit and Loss—Balance	32,575,513.91	228,673.83 Dec.
	$695,148,122.55	$13,991,502.84 Dec.